of weak solutions of the strong alkalies—potash and soda. Most salts cannot penetrate into the interior of the grain. The sugars also cannot get through the protecting layer. But many substances can get in; *weak* acids, such as acetic and butyric acid; weak alkalies, such as ammonia; a few salts, such as mercuric chloride (corrosive sublimate); and alcohol, ether, acetic ether, and many other compounds similar to these. Professor Brown's experiments bring out the fact that none of the substances normally produced during germination can escape from the grain so long as the protecting membrane remains uninjured; and that, in like manner, the salts that are normally present in soil water cannot enter; in fact, that little but water can pass into or out from the seed under normal conditions during germination.

Experiments that my son, Dr. E. F. Armstrong, and I have carried out with Laurel and Aucuba leaves,* as well as with other plants, show that plants generally are provided with *differential septa* (membranes capable of distinguishing or differentiating substances) through which water can pass at all times, but which are not permeable by the soluble materials within the plant tissues, so that rain has no effect in dissolving out substances from the leaves. Substances which enter the barley grain also enter the leaf, however. In the case of leaves provided with cuticularized membranes, apparently entry is effected primarily only through the stomata.

We have proposed to apply the term *Hormones* to all substances which can penetrate the differential septa with which plants are provided; probably on gaining an entry, such substances produce disturbances within the cells into which they penetrate by setting enzymes in action.

The effects shown with Laurel and Aucuba leaves are those of over-stimulation and the leaf is killed; by using only a minute proportion of the hormone, change may be provoked without killing the tissue.

[In proof of this statement, a set of slides was shown illustrating the normal process of development of the sea-urchin following the entry of the spermatazoon into the ovum; also another set showing the precisely similar series of changes Professor Jacques Loeb has succeeded in observing which are induced in the entire absence of the male element by exposing the freshly laid eggs, during a brief period, in a solution containing a minute proportion of butyric acid.]

In the case of the plant there are apparently two periods to be distinguished—that in which assimilation takes place under the influence of light and that in which growth takes place at the expense of the materials previously laid down: the latter probably is the period during which stimulation is necessary, that in which enzymes are brought into action as simplifying agents and the products of their

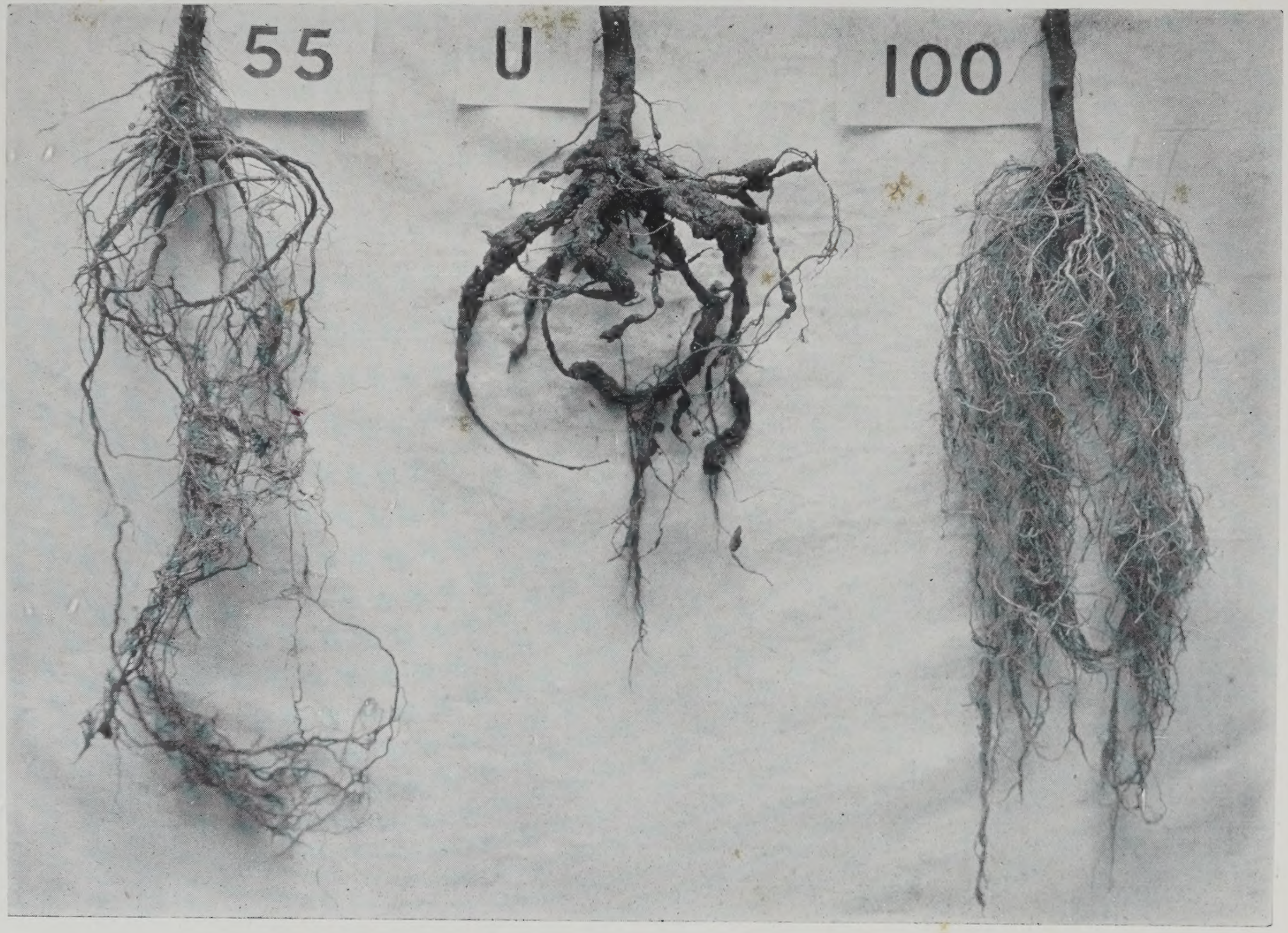
* 'The function of hormones in stimulating enzymic change in relation to necrosis, and the phenomena of degenerative and regenerative change in living structures,' *Proceedings of the Royal Society* (1910), B, vol. 82, p. 588. 'The function of hormones in regulating metabolism,' *Annals of Botany*, 1911, vol. 25, p. 507.

action enter into circulation and are carried to the places in which they can be used as building materials in forwarding growth. Probably during this period the differential septa become more or less permeable to substances which do not pass through them during the period of assimilation.

Apparently ammonia is the most active "natural" stimulant but carbonic acid is also effective as a hormone. It may well be that there are other substances present in soil, especially when it has been heavily dressed with farmyard manure, which act as more or less powerful stimulants. And let me here again point out, that a substance which is a stimulant when used in proportions not exceeding a certain low maximum at once becomes toxic when this maximum is exceeded. All horticulturists are aware of the danger attending the use of ammoniacal manures. Liquid manure prepared from cow-dung is invaluable when used with discretion but, as all know, any excessive amount is harmful.

The recommendation of well rotted farmyard manure rather than of the fresh material is explicable on similar grounds: ammonia and perhaps other hormones are given off but very gradually when such manure decays in the soil; in the early stages of the putrefaction which fresh farmyard manure undergoes, however, ammonia is produced very rapidly and in relatively considerable amounts—hence the danger attending its use. In the previous number of this JOURNAL (vol. xxxvii., p. 550), in the discussion on the Streak disease in the Sweet Pea, it is pointed out that: "Another cause of loss of vitality through root-weakening is the too prevalent practice of placing thick layers of manure between the spits in double digging." The explanation is to be found doubtless in considerations such as are advanced above; such a practice may easily give rise to excessive stimulation. I have heard of a lawn being destroyed by a dressing of wood-ashes and sulphate of ammonia—two substances which should not be applied at the same time, as the strongly alkaline wood-ashes necessarily liberate ammonia from the ammonia salt.

The experiments carried out by Dr. E. J. RUSSELL in conjunction with Mr. HUTCHINSON and Mr. PETHERBRIDGE, at Rothamsted, on the effect of sterilizing soil either by heating it or by the application of substances such as toluene, are of the greatest importance and interest from the point of view under discussion. The general result of the inquiry has been to show that the fertility of the soil is markedly increased by such treatment. It is found that the sterilized soil contains a larger proportion of ammonia than the unsterilized, and that oxidation takes place more rapidly in soil after it has been sterilized—at least two powerful hormones (ammonia and carbonic acid) are therefore present in the sterilized soil in larger proportion than in the unsterilized, and its increased efficiency may be ascribed in large part, if not entirely, to this circumstance. In some cases growth is at first retarded, but subsequently much increased in the sterilized soil—a



A B C

FIG. 5.—ROOTS OF TOMATOS RAISED IN SOIL (A) HEATED TO 55°C.; (B) UNTREATED; (C) HEATED TO 100°C.
(*E. J. Russell and F. R. Petherbridge.*)

[*To face p.* 20.

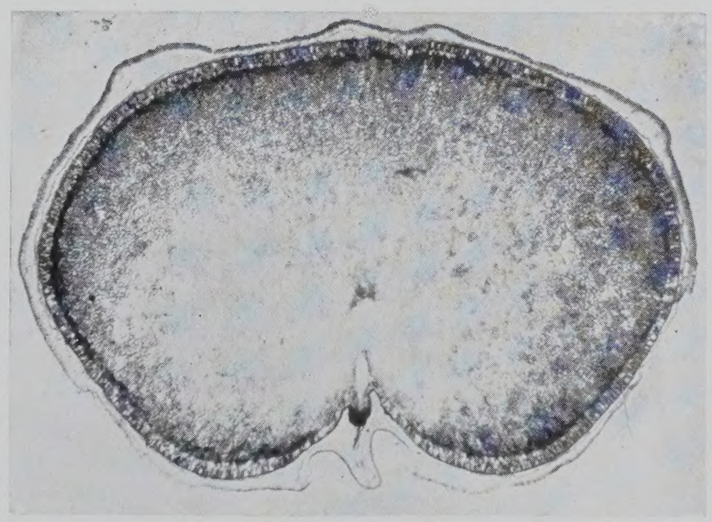


Fig. 6.—Transverse Section of Barley Grain showing Pigmented Layer.
(Microphotograph.)

FIG. 7.—MUSTARD GROWN IN (C) UNTREATED AND (D) HEATED (96°C.) SOIL.
(*S. T. Parkinson.*)

A B C

Fig. 8.—Rye grown in Soil (a) heated to 96°C.; (b) untreated; (c) treated with Toluene. (*E. J. Russell.*)

result which may be explained by the assumption that a proportion of hormone in excess of the most favourable proportion is produced in the soil. The balance is undoubtedly a very delicate one.

[A series of slides which Dr. Russell had kindly placed at the disposal of the lecturer was shown, representing results obtained in the case of chrysanthemums, potatos, tomatos, and wheat (figs. 7 and 8).]

One very remarkable effect observed, illustrated in fig. 5, is the greatly increased root growth which often takes place in sterilized soil. The explanation advanced by Russell and his co-workers is that soil ordinarily contains a great variety of competing protozoan and bacterial organisms. On sterilization, the larger protozoa are mostly, if not entirely, killed off; the bacteria are also killed but their spores survive, so that new generations can arise. Normally the protozoa live on the bacteria, whilst the latter live on the organic matters in the soil and in living on them break them down into ammonia, carbonic acid, &c. When the bacteria are alone present in the soil, therefore, greater numbers can survive and ammonia, &c., can be produced in larger proportion—hence the greater fertility of the soil.

Experiments carried out by Mr. Pickering and by Dr. Russell have also shown that germination takes place more rapidly in more or less sterilized soils than in the unsterilized soils. In this case again, if sterilization be carried too far, the effect may be to retard if not to prevent germination—doubtless because of the production of an excessive proportion of the hormone.

The results of modern inquiry may be held therefore to show that the probable answer to the question put at the beginning of this address is—that growth is dependent on the constant application of material stimuli, and that certain fertilizers are effective because they act as stimulants. The special value of farmyard manure and of organic manures generally has long been recognized; but the reasons why it is of such special value are only now being fully revealed to us.

It is clear that many of the substances present in plants may be of direct service in promoting their growth. In the case of the Cruciferae, for example, the liberation of mustard oil or a similar substance when the glucoside present in the plant is decomposed by a corresponding enzyme must furnish an effective stimulus to growth. Parenthetically, it may be pointed out that the value of the raw onion as a digestive stimulant, long recognized by the agricultural labourer, is entirely justified by the observation that the evil smelling substance it contains, which becomes so obvious when it is crushed, is a powerful hormone.

[Specimens were exhibited showing that the Aucuba leaf is blackened when exposed over Mustard paste or shredded Horseradish or even over crushed Spring-onions—proving that these all give rise to volatile hormones.]

FERNS.

By H. B. May, V.M.H.

[Read March 19, 1912; Mr. W. A. Bilney, J.P., in the Chair.]

So much has been written, and well written, about Ferns in recent years that I am diffident in approaching the subject; but I know that garden lovers are prone to emulate the much-quoted 'busman, who is said to have spent his holiday riding on another vehicle, inasmuch as when not occupied in their own gardens they are frequently found inspecting the gardens of others, or listening to information associated with their hobby. This by way of extenuation.

Perhaps no class of plants presents so great a diversity as Ferns, differing not only in appearance and structure, but equally in their environment. Some revel in tropical swamps, others are equally at home on dry walls; and it is that diversity of form and habitat that so greatly enhances their value.

It is no part of my programme to attempt to instruct those who already have an intimate acquaintance with my subject; but my desire is to interest and enlist the sympathy of those who have little or no knowledge of the pleasure that may be derived from the intelligent cultivation of Ferns, and especially I would direct attention to their utility and adaptability for house decoration. So popular are they at the present day that it will be a surprise to many that their use for this purpose is of comparatively recent origin. Indeed, it was not until about 1860 that the London florists used the cut fronds of the Maiden Hair to any great extent in making up their bouquets, and it was a few years later before Ferns in pots were seen in Covent Garden. The pioneers in Fern culture for decorative work were my old friends the late Mr. Herbst, of Richmond, and Mr. Ouvrard, of Child's Hill, and perhaps the most popular Fern of the present day is *Pteris Ouvrardii*, better known as *Pteris major*, many hundreds of thousands of which are disposed of annually at Covent Garden and elsewhere. During the series of exhibitions held at South Kensington in the 'eighties, miniature pots and vases for small Ferns were produced by Messrs. Doulton and others, and became so popular that many thousands were disposed of each season. This was the commencement of the trade in small Ferns that has now assumed proportions that are quite incalculable. Those principally in demand are *Pteris Ouvrardii*, *P. albolineata* and its variety *Alexandrae*, *P. tremula*, *Adiantum cuneatum* and its variety *elegans*, *Cyrtomium falcatum*, popularly known as the holly Fern, several species of *Asplenium*, and many varieties of *Nephrolepis*. The development of the latter during the last few years is so remarkable that I feel impelled to make a more extensive reference to them later in my paper. Another excellent plant is *Todea africana*

(fig. 13), which is really a miniature tree-fern; graceful in habit, it possesses those qualities so desirable in plants used in dwelling-houses, the surface of the fronds being devoid of hairs, thus enabling it to be easily cleaned, and it is not readily affected by draughts. Other popular plants are the dwarf tree-fern *Lomaria gibba* and its congener, *L. ciliata* and its varieties, of which *grandis* is one of the most desirable; these will be found to require water more frequently than many other ferns. Of Davallias there are many both charming and interesting (fig. 10). *Davallia Mariesii* and its variety *cristata*, though deciduous, are beautiful when grown naturally and not in the form of those monstrosities imported from Japan. *D. canariensis*, known as the Haresfoot Fern, is not only decorative but may be grown quite easily in an apartment. *D. bullata* is another useful variety, and even when denuded of its fronds its coloured rhizomes are by no means unattractive. *Osmunda palustris* and its variety *Mayi* are graceful in appearance, and retain their fronds for a long period. Of British ferns, perhaps the most suitable are *Scolopendrium vulgare* and many of its varieties; beyond watering, these require but little attention, the foliage remaining in good condition throughout the year. I have enumerated only those ferns which are most commonly used for decorative purposes, but there are many others less known that are equally adaptable. I have in my mind a number of Scolopendriums that have for a long period furnished a window in a dairy on the South Coast, some of them for more than twenty years, and bear eloquent testimony to the care bestowed on them.

We may now revert to the *Nephrolepis*, the development of which is of quite recent date, most of them being varieties of *Nephrolepis exaltata*, known in the U.S.A. as the "Boston" Fern. For many years there were very few novelties. In the 'eighties I produced *grandiceps* and *multiceps*, then, after a lapse of time, came *N. exaltata superba* (fig. 12), one of the most beautiful ferns I have had the good fortune to introduce, followed at a later date by *N. Piersonii* from America. The last has been the progenitor of numerous others as diverse in character as they are beautiful; many of them originated as "sports," that is, they were not raised from spores, the variation occurring in the stolons which are such a characteristic feature in this genus. These varieties are not only beautiful in themselves but are among the most useful subjects for house and conservatory decoration with which I am acquainted; easy of culture, they may be kept for a considerable time in excellent condition, and will amply repay the care and attention bestowed upon them. As inquiry is frequently made as to treatment, I would advise the plants should be protected from draughts, watered sparingly, especially in winter, never allowing them to stand in water, and the foliage kept free from dust; this may be effected by sprinkling or syringing, or, still more effectually, by sponging the fronds, always excepting the plumose Nephrolepis and Adiantums.

For cultivation under glass the range of subjects is, of course, much more extensive, and the interest and enjoyment proportionately greater. Here one may specialize on some particular species or generalize by growing all the varieties suitable for the structure at disposal. In stove-ferns the lovely *Adiantum Farleyense* easily takes first place amongst Adiantums; but the variety recently introduced from Holland as 'Glory of Moordrecht,' which for brevity I catalogue as *gloriosum*, is much easier to cultivate, and greatly resembles it in form and structure. It attains a greater size, and may be grown in a much lower temperature. *Aglaomorphia Meyeniana* should find

FIG. 9.—GYMNOGRAMME OCHRACEA.

a place in every collection, as should some of the Aspleniums, notably *Asplenium Drueryi* and *A. marginatum*. The Davallias are numerous, varying as they do from the diminutive *Davallia parvula* to the majestic *D. fijiensis robusta*; the majority are easily grown and give character and distinction to the collection. Platyceriums or Stag's Horn ferns are indispensable, and should under no circumstances be omitted. Of Polypodiums *Polypodium Knightae*, a comparatively recent introduction, is very desirable, and may be grown either as a pot plant or suspended in a basket. Gymnogrammes should on no account be omitted; the species are numerous, their graceful fronds being powdered with farina varying in colour from dead white to deep gold (figs. 9, 17).

Fig. 10.—Davallia solida superba.

[To face p. 24.

Fig. 11.—Pteris argyrea.

Fig. 13.—Todea africana.

FIG. 14.—TRICHOMANES RENIFORME.

The number of ferns amenable to greenhouse treatment is very great, including as it does a large majority of the Adiantums and nearly all the species of Pteris, which in themselves are so numerous that every taste may be gratified. Here again we find the Davallias, Aspleniums, Cyrtomiums, Lastreas (of which I would specially commend *L. erythrosera*), Lomarias, Lygodiums, indispensable as climbing plants, many Nephrolepis including the lovely *exaltata superba*, and several Platyceriums and Osmundas (figs. 18, 19), of which again we have several introductions of sterling merit in recent years that are well worthy of attention. Of Pteris may be mentioned *Pteris Childsii*, *P. Alexandrae*, several varieties of *P. serrulata*, *P. Summersii*, and *P. Wimsettii*. Then there are the glorious *Todea superba* and other filmy ferns such as *Trichomanes radicans* and *T. reniforme* (fig. 14). As previously mentioned, the varieties of Nephrolepis are many, and should be in every collection. Among comparatively recent introductions are *N. Marshallii* (fig. 15) and its variety *compacta*, *N. Scholzellii*, *N. Todeoides*, *N. Whitmanii*, *N. crispato-congesta* (a veritable pigmy, intensely interesting), *N. Mayi ornata*, and *N. superbissima*, all of them worthy of attention. These are but a tithe of what may be selected with advantage, but they will afford the beginner some indication of the good things at his disposal.

Hardy ferns are so great in variety and many of them so easy of cultivation that no one need despair. Athyriums, Lastreas, Osmundas, Polypodiums (fig. 16), Polystichums, and Scolopendriums in infinite variety afford an almost unlimited choice to the cultivator. A very desirable kind in this section is *Pteris Nicholsonii*, thought by some to be synonymous with *P. esculenta*, but my revered friend the late Mr. Geo. Nicholson, the well-known Curator of Kew Gardens, who kindly sent it to me, and whose knowledge of ferns was very extensive, was not of that opinion, and only a short time before his death he dictated a letter expressing the pleasure and appreciation of himself and family at its being named after him. It makes a capital basket-plant, the Gleichenia-like rhizomes spreading rapidly, and the fronds have that hardness of texture so desirable in plants that are used for suspension and are consequently much exposed.

Many persons when expressing their admiration of ferns regret they have no suitable place in which to grow them. May I say there are but few places that with a small expenditure of time and ingenuity may not be adapted? Some ferns may be grown with success amidst most unpromising surroundings; some of the finest plants of the beautiful *Scolopendrium crispum* I have ever seen were growing in an open border in a suburban garden, no shade of any kind being afforded, nor were they ever watered; but before planting the ground had been deeply dug, and each season the plants were liberally top-dressed with manure. Even the back-yard of a town dwelling may be made attractive, providing protection is given from the depredations of domestic animals. Many varieties of filmy ferns need only the shelter of a cold frame. At Wisley

may be seen delightful specimens of *Todea superba* grown in this manner, and in the interstices of the structure are numerous self-sown plants of *Lomaria fluvialitis*, growing luxuriantly. When shade is desirable an excellent plan is to make a framework of narrow deal battens and cover it with plasterers' laths placed a little less than half an inch apart; this will give all the shade necessary, even in the hottest season. The screen may be removed in the early evening, when the cultivator may contemplate with pleasure the result of his exertions. At night it may be replaced as a protection from heavy storms and the inquisitiveness of predatory animals. The screens may be coloured with one of the many distempers or other paints that are easily procurable, and thus render them presentable.

In making a plantation of hardy ferns I have invariably found the best results are obtained by using pot-grown plants, as many of them are impatient of removal and take at least one season to recover, and all who value their peace of mind I would warn against obtaining those low-priced plants offered by itinerant vendors and others. These plants, which frequently are ruthlessly torn from their surroundings, even if they survive, which is doubtful, are necessarily a long time before they are in any way effective.

I would strongly recommend those who have not previously grown ferns to commence with those of easy culture; by so doing they will acquire a knowledge of the treatment required, and will then be able to extend their cultivation to others that require more exacting conditions.

Inquiry is frequently made as to watering: should it be overhead or otherwise? To many British ferns overhead watering is beneficial; a light sprinkling in the evening with a very fine rose watering-pot during the period of growth will materially assist in the development of their fronds; on the other hand, to many of the stove and greenhouse ferns water should only be given at the roots. Adiantums especially resent the wetting of the foliage, as it results in the fronds being tipped and causes disfigurement. Many persons regard ferns as semi-aquatics that should be dosed with water upon every opportunity; nothing could be more fatal to their success, and I have no hesitation in saying that a very large percentage of failures are due to injudicious watering.

In thus eulogizing the plants that have for so many years afforded me the greatest pleasure and delight, let it not be thought I would underrate those denizens of our gardens, too numerous to mention, that give of their splendour and fragrance from early spring to late autumn and afford solace and enjoyment equally to peer and peasant; but I am forced to regard their charms as evanescent when compared with ferns, the beauty of which, if less demonstrative, is certainly more durable, and they have, I think, an unequalled claim to our esteem, seeing they may be grown with success in positions where to grow flowering plants would be impossible, and any attempt to do so could only result in failure and disappointment.

DARWIN AS ECOLOGIST.

By Rev. Professor G. Henslow, M.A., V.M.H.

[Read April 16, 1912; Dr. A. B. Rendle, M.A., F.R.S., in the Chair.]

Since the year 1859 the world has been accustomed to associate Darwin's name with "Darwinism," or the "Theory of the Origin of Species by Means of Natural Selection." Present-day Darwinians still do so, apparently quite ignoring the fact that Darwin gave us an alternative explanation of evolution; for he introduced it in his "Variation of Animals and Plants under Domestication" (1868) and abundantly in the sixth edition of "The Origin of Species" (1878), which is stated to have embodied his corrections up to 1872.

It is first desirable to explain what ecology *means* and all that it *embraces*, for the ultimate result of it is the discovery of the true Origin of Species. By saying that Darwin was our first ecologist, I mean that he was the first to realize the immense importance of studying the structure of plant-organs in relation to the plant's own requirements. *E.g.*, all botanists knew of the short- and long-styled primroses; but Darwin alone investigated their meaning, in reference to external influences—in this case, their pollination by insects.

Moreover, he came to realize the fact that allied species separated by the ocean *must have had a common origin* and inferred that the environment had *somehow* been the cause of their differences. In fact he perceived that appreciation of the facts of evolution was the outcome of the geographical study of living and extinct animals and plants.

It is only the word "ecology" which is new now, but "evolution" was new in the 'thirties.

We must go back to 1820 to find the first really scientific treatment of geographical botany. We must turn to M. A. P. de Candolle's "Géographie Botanique."* In this article he makes three generalizations.

The first two are as follows:—1. "The influences which the *exterior elements* exercise upon plants and the *modifications which result for each species*." This corresponds with Darwin's "direct action of changed conditions of life," giving rise to "definite results," *i.e. new variations*. 2. "The consequences which result from the *study of stations*, *i.e.* the special nature of the locality in which each species has been accustomed to grow, such referring to the climate and the soil of a given place." This corresponds to the modern "Associations" as Xerophytic, Hygrophytic, &c. While "study of stations" is exactly the same thing as "study of homes" or ecology. Though De Candolle did not realize it, Darwin clearly

* *Dictionnaire des Sciences Naturelles.* Tom. xviii. p. 359 (1820).

perceived that the conception of *evolution was the direct outcome of such study of geographical botany.*

Now let us turn to the latest exponent of ecology, Dr. Schimper, in his "Plant-Geography upon a Physiological Basis" (1903).

The objects of Geographical Botany, he tells us, have hitherto been the delimitation of separate floral districts; but this is only the foundation of the science. "The essential aim of Geographical Botany is an inquiry into the *causes* of differences existing among the various floras." "A *transformation*, always continuous, is wrought by *the reciprocal action of the innate variability of plants and of the variability of external factors.* Experience shows that morphological differentiations are profoundly and rapidly modified by changes in the environment every one of which immediately involves a change in the organization of plants. . . . It is by *adaptations* that the *causes of the differences* in the facies of the vegetation . . . are rendered more comprehensible; so that their investigation is to be numbered among the chief duties of Geographical Botany." But all this is synonymous with the search for the origin of species, which Schimper, like Darwin, proves to be the result of adaptation to changed conditions of life, through the variability of the living organism. Such was the outcome of Darwin's studies of plants and animals in his tour round the world. Dr. Warming, M. Costantin, many Americans, and others have come to the same conclusion.*

A point worth emphasizing is that Dr. Weismann insists on the *direct action of changed conditions of life*, so acting on the soma of an organism, that the effect to be hereditary *must* have influenced the reproductive organs. He seems, therefore, to mean that the organism acted upon must be an *adult*.

Darwin, however, uses the words italicized above solely for *offspring;* as *e.g.* seeds sown in a new and very different locality. Then, any changes of structure take place *between the germination and the adult stage.* For it is not till flowers (metamorphosed somatic organs) appear after the vegetative stage is completed, that the effect upon the soma may or may not be hereditary.

We may hypothetically suppose that the protoplasmic continuity from cell to cell may be the mechanism for passing on the influence from the soma to the ovule. But that such a result is somehow procured is to be seen everywhere.

Let us now turn to the "Foundations of the Origin of Species," written in 1842.

Dr. F. Darwin traces the conception of evolution in his father's mind from some period during his voyage, starting apparently with his reflections on the Pampian fossils of South America and the flora and fauna of the Galapagos Archipelago, situated some six hundred miles from the west coast of South America. He quotes as follows from his father's note-book 1837-8 (that was *before* he had read Malthus's

* In the above quotation the italics are mine

FIG. 15.—NEPHROLEPIS MARSHALLII COMPACTA.

[*To face p.* 28.

Fig. 16.—Polypodium cambricum Prestonii.

Fig. 17.—Gymnogramme peruviana argyrophylla.

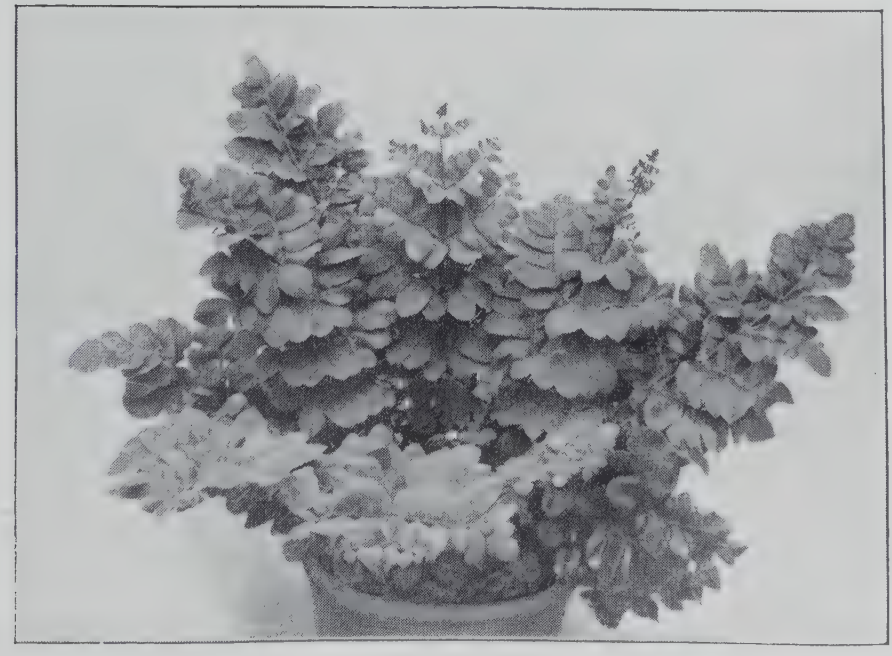


Fig. 18.—Osmunda palustris crispato-congesta.

Fig. 19.—Osmunda palustris undulata.

"Essay on Population"):—"Propagation [descent] explains why modern animals, same type as extinct; which is law; almost proved." "Countries longest separated, greatest differences; if separated from immersage, possibly *two* distinct types, but each having its representatives—as in Australia." "Will this apply to the whole organic kingdom, when our planet first cooled?"

Here we have the first glimpse of the idea of evolution, with the differentiation of species by *isolation* in different regions. In the following sentence we find DARWIN appealing to *Adaptation*, *i.e.*, the first observation of ecology. "Why does individual die? To perpetuate certain peculiarities (therefore adaptation) and obliterate accidental varieties and to accommodate itself to change (for, of course, change, even in varieties, is accommodation). Now this argument applies to species."*

In this instructive passage we find a hint of natural selection in the words "obliterate accidental varieties," corresponding to "injurious variations which would be rigidly destroyed"†; while accommodating itself to change is self-adaptation. In other words, exactly the same inferences are the outcome of modern ecology.

Again, referring to a variety of an ostrich and a Galapagos bird, he says:—"This requires [the] principle that the permanent variations produced by . . . changing circumstances are continued and produced according to the adaptation of such circumstances, and therefore that death of species is a consequence . . . of non-adaptation [this is called 'injurious'] in the 'Origin &c.' to [changed?] circumstances."‡ This was written before 1842.

Dr. F. DARWIN quotes an interesting remark of HUXLEY'S, which corroborates what I am contending. He said:—"Much more weight is attached to the influence of external conditions in producing variation and to the inheritance of acquired habits than in the 'Origin &c.'"§

If we now pass from these early views to his more precise expression in later years, we find him writing as follows:—"If we reflect on the vast diversity of the plants and animals which have been cultivated . . . we are driven to conclude that this great amount of variation is due to the *conditions of life not being so uniform* and somewhat [extremely?] different from those to which the parent-species had been exposed under nature."

"The conditions of life appear to act in *two* ways, (1) *directly* on the whole organization or on certain parts; and (2) *indirectly* by affecting the reproductive system."‖

"With respect to *Direct Action*, the effects on the offsprings are either *Definite* or *Indefinite*.

"They may be considered as *definite*, when all or nearly all the

* *Life, &c.*, ii. pp. 5, 7.
† *Origin*, sixth edition, p. 63.
‡ *Life, &c.*, ii. p. 8.
§ *Ibid.*, p. 14.
‖ *Origin, &c.*, sixth edition, p. 5. The italics are mine.

offspring of individuals, exposed to certain conditions during several generations, *are modified* in the same manner.

"*Indefinite* variations are a much more common result of changed conditions [*i.e.* under cultivation in complex soils] than *definite* . . . and have probably played a more important part in the formation of our *domestic* races," but *not* in nature.

"*Indirect Action* is through the reproductive system." DARWIN here alludes to hybrids, and the difficulty in breeding wild animals in confinement, as well as to tropical plants.*

DARWIN illustrates "direct action" by geological changes:—"According to nature of new conditions, so we might expect *all* or the majority of organisms *born* under them to vary in some *definite* way . . . the *variations* being the direct and necessary *effects of causes* which we can see, and which can act on them . . . such new varieties may then *become adapted* to those external agencies which act on them."

Again, "One problem," he tells us in 1842, he had overlooked, namely, "the tendency in organic beings descended from the same stock to *diverge* in character as *they become modified* . . . the solution, as I believe, is that the modified offspring . . . *tend to become adapted* to many and highly diversified places in the economy of nature." (My italics.) This "tendency" corresponds with the present idea of "Response."

The above quotations show clearly that DARWIN saw that "*Hereditary Adaptive Structures*" were the outcome of the *Direct Action* of changed conditions of life. These are identical with new varietal or specific characters.

In October 1838 he read MALTHUS's "Essay on the Principle of Population" (1798), and "being well prepared to appreciate the struggle for existence . . . it at once struck me that under the circumstances favourable variations would tend to be preserved and unfavourable ones to be destroyed. The result of this would be the formation of new species. Here, then, I had at last got a theory by which to work."

We are now passing to the stage when DARWIN adopted "indefinite variation" under cultivation, with "natural selection," after reading MALTHUS's work.

The following is MALTHUS's contention. He argues that "a population when unchecked doubles itself in every twenty-five years, or increases in a geometrical ratio." But with regard to food in a "limited territory," the output is obviously limited, and "considering the present average state of the earth (A.D. 1798) the means of subsistence, under circumstances the most favourable to human industry could not possibly be made to increase faster than in an arithmetical ratio."

What, then, will check population? "The immediate check may

***Origin, &c.*, sixth edition, p. 6. I cannot find any allusion to the *origin of species* by "Indirect Action."

be stated to consist of all those customs, and all those diseases which seem to be generated by a scarcity of the means of subsistence; and all those causes independent of this scarcity, whether of a moral or physical nature, which tend prematurely to weaken and destroy the human frame."

The above brief quotation will be enough to show that this process of "natural selection" in the human race has nothing whatever to do with the *origin of specific characters.* Whatever infants die of, it is not that they are born with, or develop, "injurious bodily *characters,*" or inadaptive *variations*, as DARWIN supposed to be the case with animals and plants. They die by "fortuitous" destruction, such as diseases, inherited or acquired, or feebleness of constitution, &c. but they never—*i.e.* amongst any fixed population—*start a new race* by "favourable variations," as we shall see DARWIN assumes in the, so to say, classical passage on Natural Selection, quoted here from the "Origin of Species by Means of Natural Selection."

The following is what I call the *locus classicus* of the theory;* "Can it be thought improbable, seeing that variations useful to man have undoubtedly occurred, that other variations useful in some way to each being in the great and complex battle of life should [sometimes, first edition] occur in the course of many successive [thousands, first edition] generations? If such do occur, can we doubt (remembering that many more individuals are born than can possibly survive) that individuals having any advantage, however slight, over others, would have the best chance of surviving and procreating their kind? On the other hand, we may feel sure that *any variation in the least degree injurious* would be rigidly destroyed. This preservation of favourable individual differences † and variations, and the destruction ‡ of [those which are] injurious, I have called Natural Selection [or the Survival of the Fittest] (wanting in the first edition).

DARWIN compares Natural Selection with that of horticulturists; but they are not really comparable. In the garden man selects individual plants and destroys the rest; but every one which he discards would have grown equally well had it been left. DARWIN substitutes "injurious"—*i.e.* death-bringing—inadaptive variations to account for the majority dying. The cause in reality is *not* in any want of adaptability in the individuals, but the circumstances of the struggle for existence with one another. But it often happens that one species drives out another in one place; but the reverse may take place elsewhere—*e.g.* "*Carex arenaria* in sand chokes those which in clay choke it," as Professor J. S. HENSLOW observed in 1825.

No material changes of importance were made in four editions of the "Origin." The fifth appeared in 1869. In a letter to VICTOR CARUS in that year he says: "The new edition is only two pages at the end longer than the old [first?]. Many of the corrections are only a few

* *Origin, &c.*, sixth edition, p. 63.
† In first edition "Variations," without "individual differences."
‡ In first edition, "Rejection."

words. . . . Thus I *have been led to place somewhat more value on the definite and direct action of external conditions;* to think the lapse of time, as measured by years, not quite so great as most geologists have thought; and to infer that single variations are of even less importance in comparison with individual differences, than I formerly thought."*

If we look for a *cause* in DARWIN's mind which led him henceforth to regard evolution from an ecological point of view, we shall find it in the following letter to LORD FARRER: "It is to me delightful to see what appears a mere morphological character found to be of use. It pleases me the more as CARL NÄGELI has lately been pitching into me on this head. HOOKER, with whom I discussed the subject, maintained that uses would be found for lots more structures and cheered me by throwing my own orchids into my teeth."†

To discover *uses—i.e. adaptations* and how they arise—is the very essence of ecology. It is no exaggeration to say that every *cell* is of use and every *tissue* indicates adaptation as the result of response to the surrounding conditions of life. I will now select two sentences out of many for comparison between the sixth and first editions of the "Origin &c." "There can be little doubt that the tendency to vary in the same manner [*i.e.* by *response* to the *direct action of* changed conditions] has often been so strong that all the individuals of the same species have been similarly modified without the aid of any form of selection."‡ This does not occur in the first edition.

In the following sentence the words "natural selection" are omitted from the sixth, but are found in the first edition. "Within a confined area . . . natural selection will always tend to preserve all the individuals varying in the right direction."§ In the sixth edition we read: "All the individuals varying in the right direction . . . will tend to be preserved."||

In replying to Mr. St. G. MIVART's criticism, Darwin observes: "He often assumes that I attribute nothing to variation, *independently of natural selection*; whereas, in my "Variation under Domestication"¶ I have collected a greater number of well-established cases than can be found in any other work known to me."**

Nevertheless DARWIN observes: "It appears that I formerly underrated the frequency and value of [the direct action of external conditions] as leading to permanent modifications of structure, independently of natural selection. When I wrote the 'Origin' [1859] and for some years afterwards I could find little good evidence of the direct action of the environment. Now there is a large body of evidence."†† Perhaps it was due to Dr. WEISMANN's influence that Darwinians lost sight of "direct action"—*i.e.* on the *soma*—and

* *Life, &c.*, iii. pp. 110, 111.
† *C. Darwin and the Origin of Species*, by E. B. Poulton, pp. 20, 21.
‡ *Origin, &c.*, sixth edition, p. 72. § *Op. cit.*, first edition, p. 102.
|| *Op. cit.*, sixth edition, p. 80.
¶ *Variation of Animals and Plants under Domestication*, ii. p. 273.
** *Origin, &c.*, sixth edition, p. 421.
†† *Life, &c.*, iii. p. 159.

looked for some *internal* cause for variations, since he maintained that external influences could not produce hereditary results, unless they affected the reproductive system. This may account for the fact that the question of heredity has been so much discussed of late years.

In plants, all variations in the *soma*—*i.e.* the vegetative organs, root, stem, leaves, &c.—arise *long before* any reproductive organs—*i.e.* flowers and fruits—exist, since the latter are metamorphosed of leaves. Hence WEISMANN's view is inapplicable to plants. We now know that, although new adaptations arise in the vegetative system before flowers are borne, nevertheless by some mysterious process the *power of forming them* is so infused into the whole system of the plant, that they *can* be reproduced, not only by fragments of the *soma*, but by the seeds as well; for this power reaches them as being fundamentally part of the soma, too;* perhaps the agent is protoplasmic continuity.

Conclusion.—It is impossible to say whether DARWIN, had he lived till to-day, would have abandoned the theory of Natural Selection as a *means* of the Origin of Species; but that his latest views on variations would have been more in evidence in the seventh and later editions of the "Origin &c." we may feel quite sure. For example, in 1872 he believed that "changed conditions generally induce mere fluctuating variability, but *sometimes* they cause direct and definite effects"†; whereas, in 1876 he wrote: "Now there is a *large* body of evidence."‡

In the "Conclusion" DARWIN shows how keenly he felt that he had been misrepresented by writers who asserted that he "attributed the modifications of species *exclusively* to natural selection." He calls the reader's attention to the Introduction of the first edition, in which he wrote: "I am convinced that natural selection has been the main but not the exclusive means of modification." (1859.) He adds: "This has been of no avail. Great is the power of steady misrepresentation; but the history of science shows that fortunately this power does not long endure."§

It may be observed that nineteen years had then elapsed since the first edition was published; and the misrepresentation still exists, and forty years have passed since he corrected the last edition in 1872.

I trust this lecture will go some way towards not only proving DARWIN to have been justified in his complaint; but that it will show those who still misrepresent him, that he found abundance of evidence of the origin of species without the aid of any selection at all.

The *Origin of Species by Means of Natural Selection* is, in fact, now quite out of date; for DARWIN's faith in the direct action of changed conditions of life, in producing new varieties and species, has been proved by ecology to be based on incontrovertible *facts*.

* I have shown many examples in my *The Heredity of Acquired Characters in Plants.*

† *Origin, &c.*, sixth edition, p. 131 [corrected to 1872].

‡ *Life, &c.*, iii., p. 159.

§ *Origin, &c.*, sixth edition, p. 421.

A LECTURE ON THE HEREDITARY CHARACTERS IN THE POTATO.

By Dr. Redcliffe Salaman.

[Read April 30, 1912; Mr. A. W. Sutton, F.L.S., V.M.H., in the Chair.]

This year begins my sixth season of work on the potato, and although the results are still far from complete and in some instances equivocal, yet it may not be out of place to record their progress for the benefit of fellow-workers.

I am the more encouraged to take this course because I am convinced that in the application of the Mendelian principles of research to the potato, one has already obtained sure evidence of practical economic benefits.

In this lecture it is not necessary for me to enter into the principles on which Mendelian research is conducted, but it will suffice to say that my entire efforts have been directed towards the analysis of the factors which underlie and determine the varying characteristics of the potato plant. This analysis has not been conducted primarily with an economic outlook, but rather as an attempt to isolate the several characters, great or small, whether in flower, haulm, or tuber, in the same spirit in which a chemist would analyse some complex body. The result has justified the method, for it has, as it were, illustrated the old adage—

> Look after the pence, and the pounds will look after themselves;

for whilst studying certain characters which appeared purely of academic interest, I have, I think, been fortunate enough to light on facts which may later have an important economic bearing.

I propose to give a simple account of the characters thus far isolated in the potato plant, and to leave a fuller and detailed description for a later publication.

The Flower.—The colour of the flower of the potato may be either white, heliotrope, or purple, the last of diverse shades.

A chromogen body, a reddening factor, and a purple factor have been recognized. The heliotropes are due to the reddening and chromogen factor being united in one individual, and the purple flowers are due to the further addition of the purpling factor. White flowers are due to the absence of one or more of these determiners. In addition the potato flower is peculiar inasmuch as the pigment is confined to one or other of the surfaces of the flower. In all the domestic varieties and their descendants which I have handled, the colour is limited to the upper surface and is inhibited on the lower; on the other hand, in *Solanum etuberosum* one finds the pigment on the lower surface and an inhibitor to pigment present on

the upper. In *S. verrucosum* there seems reason to believe that both surfaces are free from inhibitors. There may thus be said to be five pairs of factors dealing with flower colour. There is probably no relation whatever between any of these flower characters and the quality or shape of the tuber.

Sterility of the Anthers.—I have already published* some of the earlier evidence I obtained on this subject, and I am not prepared to say more than that the dominance of sterility is an undoubted fact, but it is probably not such a simple matter as I first thought and represented. To practical breeders the fact of dominant male sterility is one of some slight value. I do not find that male sterility is correlated with great cropping power or any other economic character, as has been frequently suggested.

Shape of the Berry.—The berries of the domestic varieties are round, whilst of wild types, such as *S. etuberosum*, *S. verrucosum*, *S. tuberosum*, and *S. Commersonii*, they are long. Consideration of the seedlings of *S. etuberosum*, together with all their crosses, showed clearly that the length of the berry was due to a single pair of factors, that when pure to length the berry was either very long and pointed or very long and blunt. When the individual was hybrid as regards length, the berry was heart shaped; when pure to shortness it was round; and such round-berried plants breed true as regards the shape of the fruit.

The Haulm.—Only one conclusive result has emerged from my observations on the haulm, and before adverting to that I will just say that the colour of the stem is doubtless controlled by factors similar to those of the tuber. Segregation of coloured versus green stems is often most pronounced, but there are many and real difficulties in making sufficiently accurate distinctions between one type of stem colour or foliage and another to allow of numerical treatment.

The one hereditary character, however, which is clearly controlled by a single pair of factors is that of the *upright* and *prone* habit. Potato-growers have put on the market innumerable seedlings, and all of them, as far as I know, grow upright, at any rate during the major part of the season. When, however, the potatos begin to die down, or, as a result of disease, the haulms decay, then a noticeable difference may be observed between one variety and another. Some, even when dead, whether from natural causes or through disease, stand bolt upright. Such potatos, for example, are 'Up-to-date' and 'Table Talk.' Others, when nearing the fulness of their growth, tend to become *bushy*, and the lower branches, if not the entire haulm, come gradually to lie on the ground. In my experiments I have found that there is still a third class of seedlings, and that is one in which from birth onwards the plants lie flat on the ground. These have not the power to grow erect.

The "bushy" plant (*i.e.* the one that droops towards the end of its growth), such as 'Flourball' and 'Early Regent,' is heterozygous

* *Jour. Linn. Soc. Bot.* xxxix. (1910), p. 301.

or hybrid, and contains but one dose of the factor for *uprightness*, whilst the potato which lies on the ground from its birth has no *upright* factor in it at all. The result of breeding in the second generation shows that the *prone* potato, when selfed, gives rise to nothing but *prones*, the *upright* to nothing but *uprights*, but the *bushy* splits up into *uprights*, *bushies*, and *prones* in the proportion of 1 : 2 : 1.

The *prone* condition is entirely independent of any of the factors which control the growth or other characters of the potato, but it has, as we shall see later, a secondary effect on cropping. The anatomical basis of the differentiation between the prone and the upright plant is to be found in the different distribution of the mechanical supporting tissue—*i.e.* the xylem, or wood, in the lowest region of the stem. In the potato family in general there are three primary vascular bundles. In the prone plants these vascular bundles remain quite distinct and disunited. In the uprights, on the other hand, the three main bundles are found as before, but they are united by a ring of secondary, or interfascicular wood, so that the whole stem is encased in a woody sheath. Growers have doubtless rejected the prone condition as one only too liable to render the plant the more accessible to disease; but were it possible to exclude disease, I think that a *prone* potato has a great deal to be said for it. Its chief value is that in time of drought it retains the moisture around the roots, and in 1911 it was astonishing how moist the soil was under a *prone* potato and how utterly desiccated under an *upright*.

Stolons.—The stolons, or underground stems, which carry the tubers, are of varied lengths. In certain wild species, such as *S. Commersonii* and *S. verrucosum*, they may attain some six feet or more. In the parent, *S. etuberosum*, they may be two or three feet long; in the domestic varieties they are not usually more than nine inches to a foot long, and they may be very much shorter. I think that it is extremely probable that the length of the stolons is controlled by specific factors, and I have been able to show that whilst the very long stolon individuals breed true to great length and the very short also breed true, the medium varieties, when selfed, give rise to families whose stolon lengths vary from quite short to greater or lesser length. It is obvious that a character such as this does not allow of definite measurement. I am inclined to think that there are probably two, or may be three, pairs of factors which control the "stolon length."

Disposition of Tubers.—Immediately related to, if not, indeed, identical with, the subject of "stolon length" is that of the question of the relations in space between the position of the tubers and the central axis of the stem. It may be said at once that in long stolon plants the tubers are correspondingly distant, and in very short stolon plants the tubers are *close up*.

The evidence for factors controlling this disposition of tubers is practically the same as that which was found for the stolon formation:

the more *close up* the parents are, the greater the proportion of *close up* offspring, and in one case I have been able to obtain plants which breed pure to the *close up* condition. This *close up* condition of the tubers is economically of great importance, and one which is not always to be found in our domestic varieties. That the tubers should cluster closely round the stem is of value, not only in the digging, but because it allows the greatest use to be made of the land. Careful analysis of the cropping of over 1300 individuals shows that of all the good cropping seedlings 60 per cent. were *close up* plants, and 20 per cent. more or less *long stolon* plants. In some individual families the correlation between the position of the tuber on the stolon and the formation of a good crop was considerably closer than this.

Cropping.—The crop of tubers which a plant bears depends on a number of circumstances—on the soil, on the season, on the time of planting, and other causes; but in respect to the cropping of seedlings, treated as far as may be in an identical manner, in addition to these external factors there are others. As has already been shown, there is a very distinct relationship between the *close up* disposition of tubers, which is probably controlled by one or more pairs of factors, and the size of the crop; and, further, it was found last year, when the great drought affected adversely all the potato plants, that the *prone* individuals, on the whole, bore better crops, and a far greater percentage of them were good croppers than the *uprights*. The *bushy* or hybrid plants had, though a smaller percentage of good croppers amongst them than the *prones*, still a higher percentage than the *uprights*, who fared the worse for lack of moisture. It may be that besides this there is some factor definitely controlling the cropping, and I am inclined to think that it is very likely that there is such a factor. It is improbable, however, that one will be able to get at closer quarters with such, if indeed it exists at all.

My observations show that one has control of two vitally important factors in respect to cropping; the one is the disposition of the tubers and stolon length, and the other the habit of the haulm.

The Tuber.—Of the tuber characters only those in respect to shape, eye, and colour have been analytically worked out.

Shape.—The shape of tubers has long been a puzzle to growers. A variety of shapes are described by such terms as cylindrical, kidney, oval, pebble, round, and the like, but it is only an analysis on Mendelian lines which is able to bring any order out of this apparent confusion. The fact is that there is, on the one hand, a clearly defined pair of characters controlling length of tuber, and, on the other, a fluctuating variation not only affecting the families as a whole, but also the tubers of each individual plant. At an early stage of the work it became clear that there was one form of potato tuber which when selfed bred true, and which when crossed was recessive. This is the *round* potato, *i.e.* a potato tuber with a shortened axis, its vertical diameter being equal to, or often less than, its tranverse. Such a round tuber, with its depression at the point of insertion of the stolon,

resembles an apple, where the similar depression at the junction of the stalk is common. The opposite of the *round* potato is the long-axised potato, the tubers of which may be either cylindrical, pyriform, or kidney shaped, and such that are pure in respect to the character of length breed true, all the offspring being more or less alike and all possessing the long vertical axis.

Potatos which are hybrid as regards length of axis are also long in shape, because the long axis is dominant to the short; but the actual shape taken by the tubers is very variable. Many of the kidney potatos on the market are hybrids in respect to length, whilst nearly all the oval, lapstone, and pebble-shaped tubers are also borne by hybrid plants, and such plants when crossed by a round-tubered individual give rise to a family half the members of which bear long tubers and the other half round. As constancy of shape is desirable, and as hybrid individuals vary, according to my observations, more than others, I think it is highly desirable in selecting a new variety that one should be chosen that is known to be pure to length.

When tubers are young they are generally of the typical round form, but those that are pure to length often begin their existence as elongated tubers, however minute.

It should be observed that owing to the drought in 1911, when a great many varieties suffered from secondary growth, these secondary outgrowths were all round, even when they were attached to cylindrical tubers. It will be of interest to see whether in 1912 these round outgrowths produce, vegetatively, tubers like themselves, or whether they revert to the long forms from which they arose. I think it is quite possible that there are other factors which control the transverse axis of the tuber, but so far their determination has eluded me.

Tuber Eyes.—The eyes or buds of the tuber may be either deeply inserted or quite superficial, and a single pair of factors controls their disposition. The deep eye is recessive, and breeds true; the superficial eye is dominant. The hybrid is superficial-eyed, but it frequently happens that the dominance is not complete, and it was because in my original observations* I classed all hybrids which showed the slightest trace of depth of eye as deep that I spoke of the latter as being dominant; whereas now I am convinced that the superficial eye is far more of a dominant nature than the deep is, and am therefore in agreement with East, who pointed out this fact before my paper was published.

Monstrous over-growths of the "eye-brows" in the tuber are not uncommon. I have examined two cases exhaustively, and do not find the condition to be inherited either sexually or vegetatively.

Colour of Tuber.—Tubers may be either white-skinned, red-skinned, or black (*i.e.* deep purple). Mendelian analysis shows that the red coat of tubers is due to at least two distinct factors, the absence of either of which renders the tuber white, whilst the purple tuber is due to the presence of a third factor.

* *Jour. Genetics*, 1 (1911), p. 27.

On four different occasions coloured families have been made by uniting white-tubered plants, a phenomenon entirely in accord with the experiments of BATESON and others in sweet peas and Primulas. In addition to these factors there are probably diluting factors which react on the purple, but these have not been fully investigated.

It was found that *S. etuberosum* of Lindsay is in possession of a factor rendering white dominant to purple, and I think it probable that this inhibitor of purple is an element not normally contained in any of the domestic varieties.

Coloured Flesh.—Red and purple coated tubers are often similarly pigmented in their flesh, but this pigmentation can be clearly shown to be due to a single pair of factors, and it is thus possible to produce a dark-coated tuber which is absolutely unpigmented inside, on the one hand, and, on the other, a white potato, colourless inside, which, when mated with any coloured variety, will cause all its coloured-coated offspring to have coloured flesh.

Resistance to the Attacks of Phytophthora infestans.—My remarks on this subject must be brief, and made with all possible reserve and caution. In 1909 and 1910, when the disease was exceptionally severe, I found that one-fourth of the seedlings of *S. etuberosum* were unaffected by disease, whilst the remainder perished. From these apparently immune individuals numerous crosses have been made and large families formed. As there was no disease in 1911, their resistance could not be tested. In this season these first-generation plants are being regrown, and, in addition, several second-generation families, in which it is hoped the recessive quality of immunity may segregate out. So far I have dealt only with the analysis of characters. My work this year and in the future will be directed rather to the synthesis of characters, *i.e.* the grouping together in one plant of all the wished-for qualities that are controlled by genetic factors in a pure state. The final result of such a synthesis should be to produce a potato which will not only be good in all respects, but which will reproduce itself just as truly from flower seed as from tuber culture.

One cannot, however, at this juncture say more than that it is conceivable that a really immune potato, to which all other desirable qualities may readily be added, is not an improbable feature of the future. Should such a result ever be attained, we should be immeasurably indebted to the silent work of the patient and noble priest of Brün.

CONTRIBUTIONS FROM THE WISLEY LABORATORY.

XVI.—Bruise in Potato.

By A. S. Horne, B.Sc. (Lond.), F.G.S.

During the last few years a large number of instances have been brought to my notice of potatos affected with a black discoloration of the flesh. Since the trouble appears to be frequently of some economic importance, it is desirable to describe the symptoms. The blackening is evident immediately the tuber is cut open, and must not be confused with the discoloration which often appears after the cut surface of a tuber has been exposed to air, nor with that which often occurs *after* cooking, as described by S. F. Ashby in 1905.* The latter phenomena are not dealt with in this paper.

The first examples of the disease were received from Devonshire in 1907. They showed small greyish-black areas (fig. 20 a) in the peripheral region of the flesh. Many of them were situated between the principal vascular bundles and the periderm. They did not extend far internally, and none were found in the pith. The disease occurred among potatos sold for cooking, and considerable waste must result from the use of tubers so affected. They are very often sold at a price which should warrant a supply of sound ones. Under the circumstances the consumer actually pays for the sound vegetables available from the purchased quantity a higher price than ought to be demanded.

In some parts of the country the disease is known as "bruise." This name is aptly applied, since the discoloration resembles a bruise very much in appearance. It is often, however, erroneously supposed that the condition is the result of mutual pressure when potatos are stored, or that it is due to blows received in tumbling or falling upon the ground or upon one another.

With a view to discovering to what extent potatos of this description were sold for planting by local dealers in the North of England, several lots were purchased in 1908. These had been obtained by the dealers from Cambridgeshire and Scotland. The diseased condition was found frequently in the varieties 'Up-to-Date' and 'British Queen.' During the same season slightly affected tubers occurred among some of the varieties grown at the Cockle Park Experimental Station, in Northumberland. Additional examples were sent from other parts of Northumberland.

Diseased material was not easily obtained in the early part of the next storage period, but in May (1909)—rather late in the season—

* Ashby, S. F. "A Contribution to the Study of Factors affecting the Quality and Composition of Potatos." *Jour. Agr. Sci.* I. (1905) p. 347.

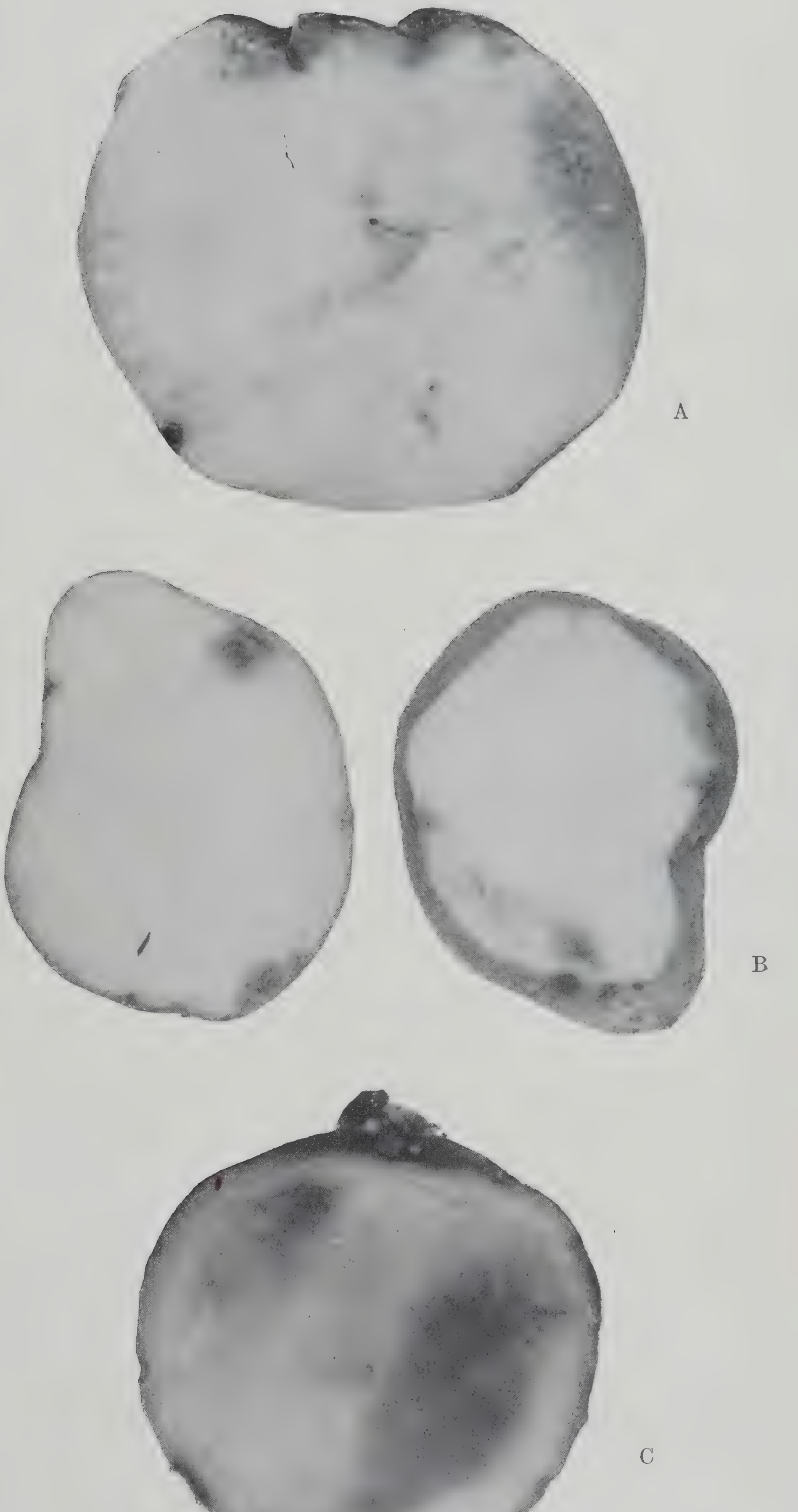


FIG. 20.—A.-C. BRUISE IN POTATO. (For description of figures see p. 50.)

[To face p. 40.

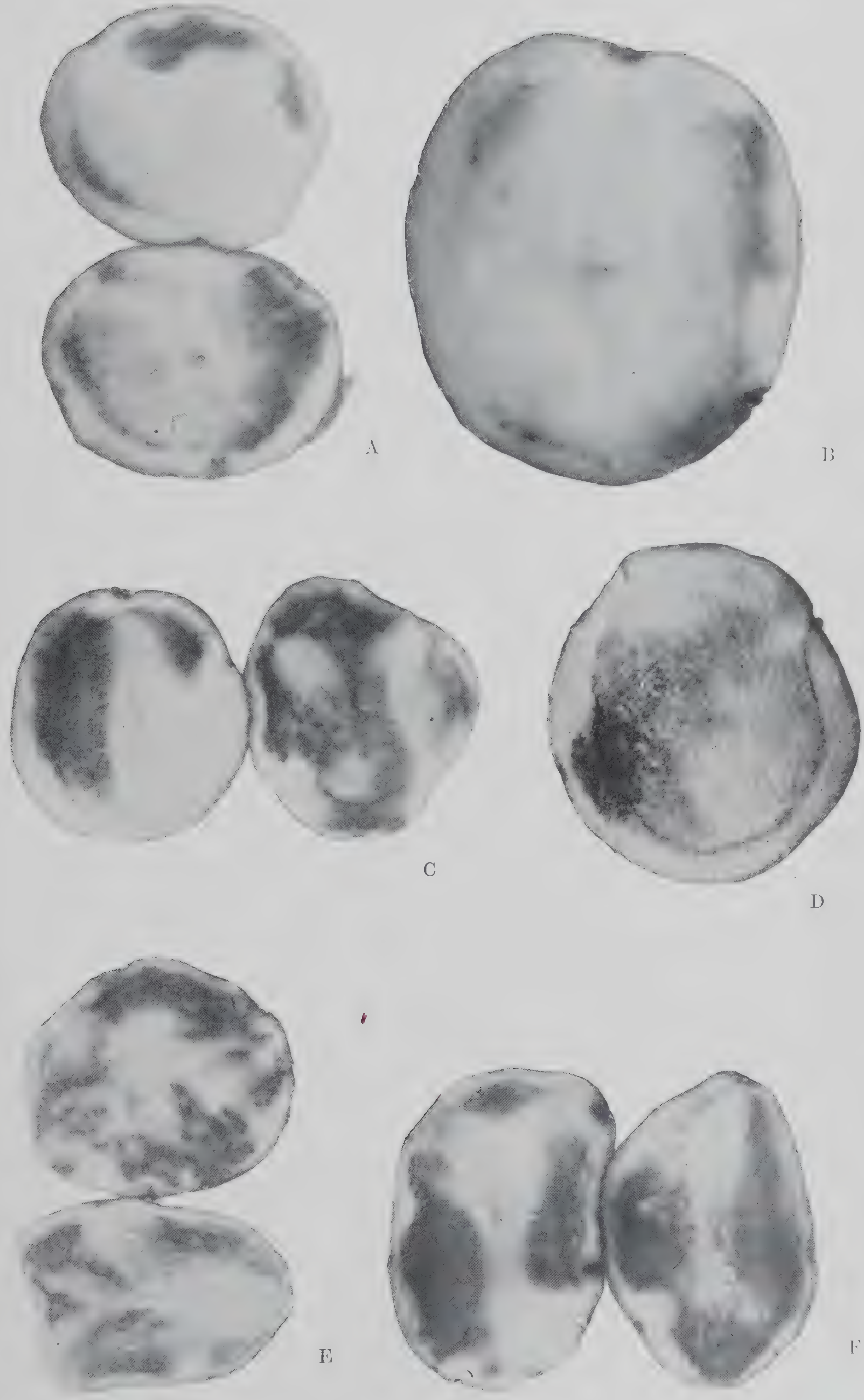


Fig. 21.—a.-f. Bruise in Potato. (For description of figures see p. 50.)

samples of seed potatos obtained from local merchants yielded the following proportions of affected tubers:—

Variety	Proportion of affected tubers
'Early Regent'	1/75
'Duchess of Cornwall'	0/70
'Schoolmaster'	30/140
'Edina'	40/154
'Scotch Express'	6/140
'Snowdrop'	3/86
'Up-to-Date'	1/100
'Table Talk'	3/100

From this table it can be seen that a very high percentage of two of these varieties was diseased, although a fair price for small quantities of good 'sets' had been paid. It is important to note that if potatos from the same source had been sold for domestic purposes, at the price which sound ones should command, the consumer would have experienced considerable loss.

In January 1909 I received 1 cwt. of potatos from Berkshire for experimental purposes in connexion with internal disease, and about the same time 1 cwt. of diseased potatos of the variety 'British Queen' from a farm in the county of Durham. The tubers of both consignments were very badly blackened, in addition to other diseases present. The blackening, however, was not confined to potatos otherwise diseased. In these instances the general symptoms were different from those hitherto observed in that the black areas were less definitely localized, but were distributed generally throughout the whole tuber (figs. 20 c and 21). In 1910 and again in 1911 examples were forthcoming of potatos affected in the manner first described, from different sources, during the storage season.

Bruise appeared in several varieties examined in 1912. The 'Factor,' grown near Wisley, was slightly affected. 'Northern Star,' sent by Mr. W. G. McGowan from East Lothian, in connexion with other experiments, was also affected, though somewhat differently from those in all the cases cited above. The matter was complicated in this case by the presence of streak-disease also.

The last examples of typical bruise were received from Professor Etienne Föex, of Montpellier, in April. The tubers originally came from the Département des Hautes Alpes, and were sent to Montpellier by Professor Cadoret, with the note that the disease—presumably the one affecting the tubers sent to me—is said to occur throughout the Department, that it was worse in 1910 than in 1911 (a very dry year), and that the variety 'Early Rose' was more affected by it than the local varieties were.

With a view to ascertaining whether this disease would occur in the produce obtained from planting diseased tubers, small experiments were arranged in 1908.

Experiment I.

Seed potatos of the varieties 'Up-to-Date' and 'Northern Star,' raised in Scotland, and of the varieties 'Northern Star' and 'British Queen,' raised in Cambridgeshire in 1907, were planted in the garden of Armstrong College, Newcastle-upon-Tyne, on May 4, 1908. The soil was comparatively poor, dark garden soil, and was not heavily manured. The crop was lifted in September, but when examined was found entirely free from any disease.

Experiment II.

Potatos of the variety 'British Queen' obtained from the county of Durham, badly affected with a black discoloration of the flesh, as shown in the illustrations (fig. 21), were planted some in Devonshire and some in the garden of Armstrong College. The conditions in the latter locality were similar to those described in Experiment I. Those planted in Devonshire were grown by Mr. George Kerswell, of Bowhill, Exeter, in soil not previously used for potatos. The character of the soil was totally different from that used in Newcastle. It consisted of a stiff red clay formed from the subsoil above breccia of Permian age. The climatic conditions were of course very different from those of the North of England. The crop was lifted in September, but was, in both cases, without a trace of the blackening which was present in the parent seed potatos.

The tubers yielded by these experiments were carefully stored in Newcastle during the winter, and examined again in the following May. They were found quite free from the disease, so that the bruised or blackened condition did not develop during storage. These experiments collectively form a specific instance of an improvement effected in unhealthy strains of varieties of potato potentially capable of yielding healthy crops by effecting a change in the soil and climate.

The disease appears in the flesh of potatos which are affected, as shown in figs. 20 A, 20 B, in the form of small greyish or purplish-grey isolated areas. These areas occur either about the vascular cylinder or between it and the periderm, so that an appearance of spreading from the vascular bundles is not a constant feature. Discoloured areas may also be present in the neighbourhood of the "eye," but they seldom seem to reach the surface of the tuber. Later on the areas become larger and of a darker colour. When observed with a lens, the dark areas present a speckled appearance which is due to the curious distribution of the dead and living cells—this is easily seen towards the margin of the area.

The blackening in the variety 'British Queen,' which is illustrated in figs. 20 C and 21, is of a different character. A series of potatos was obtained showing all stages in the blackening from its first appearance until the whole tuber became blackened. The marks appeared in the first instance about the principal vascular bundles (figs. 21 A,

21 B). They then apparently spread gradually inwards, through the stages shown in figs. 20 C, 21 D, until the condition shown in figs. 21 C, 21 F was reached.

A soft and rapid black rot of the kind characteristic of the "ring-disease" form of black-leg does not obtain. Even the worst tubers were found to be capable of producing disease-free plants. Small isolated greyish-brown areas occurred in the case of the variety 'Northern Star,' from East Lothian, already mentioned, but in some tubers the principal vascular bundles were of a brownish colour, not black, as in the 'British Queen.' The disease in this instance actually increased during the season. In one specimen a brown zone developed about the principal bundles, and by April small areas of tissue within this zone had disintegrated. The greater portion of the tuber, however, remained sound. Streak-disease occurred in this sample, but in this case it did not actually occur together with bruise in the same tuber. The two diseases frequently do occur together; *nevertheless, they are quite distinct forms, and should not be confused and treated as one and the same.*

In typical examples of bruise, a microscopic examination shows that the speckled appearance is due to the disease not spreading uniformly but in irregular lines, so that in early stages series of affected and unaffected cells are interwoven. In sections of fresh material an interesting series can be traced from normal to diseased cells.

In a short paper* read before the University of Durham Philosophical Society, the writer explained that with careful manipulation the protoplasm in the cells of potato tubers could be observed to move. This movement is most easily seen in cells which are performing some kind of work. If a potato be exposed to direct light it becomes green after a short time, owing to the development of chlorophyll in cells which under normal circumstances function for the storage of starch. Correlated with the appearance of chlorophyll the starch grains diminish in size until only a fragment of the original grain remains. If these cells be examined protoplasmic movement may be seen. It may also be observed, but with greater difficulty, in the starch parenchyma, so that it becomes possible to distinguish living from dead cells. This can actually be done on the border-line between the healthy and unhealthy tissues where series of living and dead cells are interwoven.

Both the living and dead cells are stored with starch, so that the earliest post-mortem change, which consists only of an altered appearance of the protoplasm due to coagulation, is with difficulty visible owing to the fact that the protoplasm itself is obscured by the starch grains.

The protoplasm in the cells adjacent to the coagulated ones appears to be permeated with a dark insoluble matter. It becomes altered more and more until finally the original structure is entirely obscured. There is no easily observed alteration of the cell-wall in early stages of the disease. The altered protoplasmic mem-

* A. S. HORNE, *Proc. Univ. of Durham Philos. Soc.*

brane frequently stains more deeply than does the normal protoplasm. Appearances which might be mistaken for altered cell-wall—in microtome preparations—are really due to fragments of deeply staining protoplasmic membrane. No hyphal organism has been observed in the diseased tissue.

The diseased areas in tubers affected with *Phytophthora infestans* are soon enclosed by an active wound cambium. Again, in internal disease and streak-disease, the spots or blotches and streaks of brown tissue are soon shut off from the more healthy tissue by a development of wound cork. The writer has not yet observed a formation of wound cork in bruise. It seems to be rather a remarkable exception.

A number of microtome preparations were made with the object of ascertaining whether definite forms of bacteria could be detected in the diseased cells. Bacteria were certainly not present in masses such as they have been described as occurring in diseased plant-tissues by ERWIN SMITH. Many minute bodies were present bearing a strong resemblance to them, but upon very careful microscopic analysis of the normal and diseased potato-cells, before and after fixation, it was found that intracellular particles frequently simulated bacteria in form, so that the result of the study was inconclusive.

Experiments to bring about a spread of the disease from one tuber to another produced a negative result. Neither was the diseased area observed to increase in extent in an affected tuber, except in the one case referred to above. Nevertheless, an indication was obtained that the blackening did spread during the storage period, in that tubers examined at progressively later times showed an increasing proportion of potatos affected with the disease and an increased area of disease in individual tubers.

It occurred to the writer in 1908 to test qualitatively the diseased areas of tubers affected with bruise for the alkaloid-glucoside, solanin, and to compare the reaction with that obtained when similarly situated but not actually diseased portions of tissue were treated with the proper reagents. Both the Brandt and Mandelin reactions for solanin were employed and the tests were repeated several times. In several cases the reaction was distinctly stronger in the diseased area as evidenced by the intensity of colour. Even in doubtful instances the balance of the observations was more in favour of a stronger than a weaker reaction in the discoloured tissue.

The tests were repeated in 1912, using greater precautions to secure the best possible results. These tests are now described in detail:—

1. *Mandelin's Reaction.*—This reagent was used when freshly prepared. It was made according to Mandelin's formula by dissolving one part of ammonium vanadate in 1000 parts of a mixture of 98 parts of concentrated sulphuric acid with 36 parts of water. Similar proportions were used by WOTHTSCHALL,* who tested the efficiency of both Mandelin's and Brandt's reactions. The reagent was applied to

* E. WOTHTSCHALL. "Ueber die mikrochemischen Reaktionen des Solanin." *Zeitschr. f. w. Mikrosk.* Bd. v. p. 19.

small rectangular slices of tissue from 2 to 4 mm. thick. The slices were either placed in the reagent directly after they had been prepared, or they were first rinsed in water. According to MANDELIN and WOTHTSCHALL, in the presence of solanin the following colours appear in order: yellow, orange, purple-red, brownish-red, carmine, raspberry-red, violet, blue-violet, pale greenish blue; finally all colour disappears. Series of non-etherized slices were used first. A series was cut from a diseased area in an early stage of development, so that the slices were only slightly discoloured. A second series was then taken from a similarly situated non-diseased area of the same potato. The two series were simultaneously immersed in the reagent, which was contained in white porcelain dishes standing side by side. Every test performed in this way showed a stronger colour reaction in the diseased than in the non-diseased tissue. A test was then made, using similarly situated slices from potatos of two different varieties—in this case the 'Factor' and 'Northern Star.' There was no appreciable difference in the reaction. Since G. MEYER* and VON KLEPZOW† in a quantitative test record slightly more solanin in the sub-cuticular tissue than in the starch-parenchyma of potatos, some slices were taken from the pith and the sub-cuticular parenchyma of a tuber of 'Factor' to see whether a difference could be detected by the qualitative method. In this case the section from the pith showed a slightly less strong reaction.

If fatty oils were present in the tissue, these might give colour reactions with sulphuric acid and interfere with the test. Solanin is stated to be practically insoluble in ether. If this be the case the slices may be extracted with ether and so eliminate this chance of error before applying Mandelin's reagent. Accordingly a number of slices were prepared and soaked in ether for 48 hours. The experiment was first made of transferring the slices from the ether to blotting-paper and thence to the reagent. In a second experiment, the parallel series of slices were transferred from the ether to the reagent simultaneously. In both cases the colour reaction was stronger in the diseased tissue and the sections in every case passed through the scale of colours in the proper order.

There are several difficulties and possible sources of error in performing this test. If the slices be placed in a small quantity of the reagent, the liquid needs to be frequently changed, and since the reaction takes several hours, the slices may be rendered useless before they have passed through the complete series of colour changes. Almost immediately after immersion in the reagent the slices become opaque owing to the presence of innumerable minute bubbles, which interfere with the colour effect. The same error, however, occurs in both series. The intensity of colour shown by a particular slice is influenced by the number of vascular bundles which it contains. These take an intense colour, many times more intense than that shown by the starch

* G. MEYER. *Archiv exp. Pathol.*, Bd. xxvi. (1895), p. 361.
† KLEPZOW. *Just Jahresb.* 1895, Bd. ii. (1890), p. 245.

parenchyma. Sometimes a non-diseased portion of tissue with a number of bundles will show a coloration as intense as that appearing in a diseased slice. Again, the bundles occurring in the diseased areas are generally of a yellowish or dark colour before applying the test, so that the coloration is more intense than it should be if due to the reagent alone. These points have been taken into consideration in estimating a difference in the intensity of coloration between the members of parallel series.

Brandt's Reaction.—This reagent was prepared by dissolving ·3 gm. of sodium selenate in a mixture of 8 c.cm. of water and 6 c.cm. of concentrated sulphuric acid. Parallel series of potato slices were cut as in the above-mentioned experiments and placed in test tubes containing the reagent. The preparation was then gently warmed until the first appearance of colour in the slices. The colour changes take place much more quickly than those brought about by the use of Mandelin's reagent. Various shades of red appear—raspberry-red and then currant-red—this colour passes into a brownish yellow and finally all colour disappears. G. Meyer and von Klepzow found ten times as much in the young sprouts as in the starch-parenchyma. Jorissen and Grosjean* also found a relatively greater quantity in the fresh early shoot. In order to test the efficacy of the qualitative test, comparative slices were made from the pith and young sprouts of the variety 'Duke of York.' A much more intense coloration was obtained in the slices from the sprout. Comparative slices from the starch-parenchyma and sub-cuticular tissue of 'President' were tried, but the test was inconclusive. In the case of 'Factor,' the sub-cuticular tissue yielded a slightly stronger reaction than the starch-parenchyma. The difference in the amount of solanin obtained by G. Meyer and von Klepzow from the sub-cuticular tissue and the starch-parenchyma, however, was only 0.05 gms. in 1000 of material. The fact that the qualitative tests do actually express a difference already known to exist from the results of quantitative analysis lessens one's reluctance to accept the results obtained from tests of this kind. Using parallel series of diseased and non-diseased slices obtained from similarly situated tissue of the same potato, a stronger coloration was again obtained in the diseased ones. This reaction has advantages over Mandelin's, notably in that, owing to warming the slice, there is less trouble from occluded bubbles, and that the reaction takes place more rapidly. In this case also the vascular bundles of the slices were relatively strongly coloured, and the cylinder of bundles in those obtained from the young sprouts of the 'Duke of York' variety was particularly conspicuous.

Discussion of Probable Cause of Bruise.

It has been shown in a particular case that tubers affected with bruise, when transferred to conditions of soil and climate other than those under which they were raised, produced healthy ones. It has

* Jorissen u. Grosjean. *Bull. Acad. roy. belg.* (5), tom. xix. (1890), p. 245.

been deduced therefrom that an improvement in the condition of the strain of the variety used was effected. It would be unwise, however, from the results of so few experiments, to suggest the practice of sending "seed" diseased in this way to another locality with the object of eliminating the disease. All experiments of this kind need to be repeated year by year to be increasingly valuable. Nevertheless, there are secondary considerations which are in harmony with the narrower results. It is significant that the affected tubers are difficult to obtain in the autumn; it is not until the middle of, or late in, the storage season that the disease becomes unpleasantly evident. The expression of any constitutional weakness, from whatever cause derived, might be expected to develop in this period. Again, it is noteworthy that, although the soils used in the experimental plots were relatively poor, yet this particular disease did not occur on the land in question in the two years following that in which the original experiments were conducted. If this result be compared with others obtained by the writer from planting diseased tubers affected with internal disease, streak-disease and *Phytophthora*, this difference is noteworthy—that whereas in the former case all the sets produced healthy plants, in the latter case many sets failed to develop, and disease appeared in the crop.

The above-mentioned observations lead to a discussion of the probable cause of bruise. It has been pointed out that the earliest stage of the disease involves the death of the storage-cell, as indicated by a change of the refractive index of the protoplasm and by the fact that the protoplasm ceases to move. Subsequently the dead protoplasm changes slowly, until the original structure is obscured. The earliest changes are not associated with the presence of any hyphal organism within either the cells or the intercellular spaces, so that the direct injury to the tissue must be due either to bacteria or to some physiological circumstance. Several obscure diseases have received a purely physiological explanation—after repeated failures to isolate definite pathogenic bacteria—such as, for instance, the Mosaic disease * of tobacco, which is said to be due to a disturbance of the normal physiological activity of the cells of the affected plant, owing to "cutting back." A few years ago BIDGOOD† suggested a theory of the cause of certain spot-diseases of *Calanthe* leaves based upon observations made by SCHUNK‡ upon the presence of an unstable glucoside in the leaves of *Phajus* and *Calanthe*. SCHUNK found that the glucoside in question (indican) decomposes spontaneously with the production of insoluble indigo in the cells as soon as the vitality of the cell is destroyed. BIDGOOD'S suggestion is that the decomposition of indican with the production of insoluble indigo, owing to a lowering of the cell's vitality, may be a cause as well as an effect of the disease, since the glucoside is so unstable that the liberation of indigo may easily be induced artificially. If Mandelin's reaction and Brandt's reaction be considered reliable

* WOODS. *U.S. Dept. of Agric.* Bur. of Plant Ind. Bull. 18 (1902).
† JOHN BIDGOOD. *Jour. Roy. Hort. Soc.* (1904-5), p. 126.
‡ SCHUNK. *Annals of Botany* (1897), p. 439.

tests for the presence of solanin in vegetable tissue, the results of the tests described in this paper indicate a greater quantity of this alkaloid-glucoside in the diseased than in the healthy areas of a given potato. If this be the case, an attractive explanation of the phenomenon of bruise may be suggested. We may suppose that there are three periods in alkaloid metabolism, as well as three periods in carbohydrate metabolism, in potato—one, say, in late summer and autumn, of production of alkaloid-glucoside (solanin) from alkaloid (solanidin) and sugar; then a resting period; and, thirdly, a time—say, in spring—of hydrolysis of the alkaloid-glucoside into sugar and alkaloid—the latter being made innocuous by processes which can occur in this period, but not in the first period. Imagine that for some reason or other the process of alkaloid-glucoside formation receives a check causing reversal; or, that the process of alkaloid-glucoside hydrolysis sets in too early, when the alkaloid formed could not be rendered innocuous; then the released alkaloid might act injuriously upon the cells in which the abnormal metabolism is taking place and constitute the cause of the injury to the tissue. It will be remembered that, in testing the diseased tissue, only slightly affected areas were used, so that the increased amount of alkaloid is apparent in the incipient stages of the disease. This point perhaps adds weight to the argument. There are in the potato a large number of internal vascular bundles, so that the starch-parenchyma is well supplied with conducting tissue, and the emptying of the store of reserve carbohydrate would take place fairly uniformly. One might expect that an interference with the normal process of alkaloid-glucoside hydrolysis would disturb this translocatory system. It is strange, however, that the affected areas should occasionally be localized to the starch-parenchyma between the principal bundle cylinder and the cork, and that they are infrequently found generally distributed in the internal starch-parenchyma.

The whole matter might be approached from an entirely different point of view. We might suppose that the cells are progressively poisoned by bacteria. The poisoning might spread slowly in the tissue from some given centre, or the effect might be produced at some little distance from the source of irritation. In two cases which have been included with the consideration of typical bruise, the disease appeared about the principal vascular cylinder. A series of stages was obtained, ultimately involving almost the whole interior of the tuber. It might appear clear to some that this phase of the disease is due to the slow action of bacteria spreading inwards from the bundles; but it might also be indirectly due to the condition of the bundles themselves.

The negative evidence of the presence of bacteria obtained from a microscopic examination, and the failure to cause the disease to spread and to isolate pathogenic bacteria perhaps count for very little. *But the whole evidence, considered collectively, is decidedly against attaching much importance to a possible organism factor in relation to the disease.* Even in bacterial diseases of potato recently described it is doubtful whether the bacteria are the primary cause of the disease. PETHYBRIDGE, in Ireland, has isolated bacteria which cause the effect

known as black-leg, but the writer's experience inclines him to the opinion that black-leg is, after all, frequently superadded, as it were, to a physiological condition of the plants affected, which would find expression in some form of disease independent of the black-leg bacteria. Another disease has been described by Miss Dale,* and the difficulty which this investigator experienced in bringing about infection of the potato plant is most noteworthy. Taking all these things into consideration, he is inclined to believe that the fundamental cause of bruise is physiological.

If this be the case, it should be capable of being cured, and it is perhaps possible to prevent its recurrence by altering or improving the conditions of cultivation. The fact that the disease has been frequently found in potatos attacked by wireworm on land only a short time brought into cultivation supports this contention.

Summary and Conclusions.

The results obtained in this investigation may be summarized briefly as follows:—

1. The disease is found among a large number of varieties of potato. It becomes unpleasantly evident somewhat late in the storage period.

2. Diseased tubers, when planted under the circumstances described, yielded a perfectly healthy crop.

3. The disease has not been induced to spread from one tuber to another.

4. In areas of potato tissue newly affected with bruise, diseased and not-diseased cells are interwoven. The earliest post-mortem change to be observed in the diseased cell is merely one of altered refractive index and protoplasmic movement which is evident in the adjoining living cells can no longer be observed.

5. A wound cambium is not formed between diseased and healthy tissue, as in the case of tubers affected with internal disease, streak-disease of *Phytophthora*.

6. No hyphal organism has been observed either within the diseased cells or the air-spaces.

7. Bacteria have not been identified within or about newly killed cells.

8. The use of Mandelin's reaction and Brandt's reaction indicates a comparatively greater quantity of the alkaloid-glucoside solanin in the diseased than in the non-diseased tissue.

9. It is suggested that bruise is fundamentally a physiological disease.

10. If this be the case it should be capable of being cured, and it is perhaps possible to prevent its recurrence by altering or improving the conditions of cultivation. S. F. Ashby, in an investigation relating to the quality and composition of potatos, pointed out that the best "came from soils which were neither lacking in the coarse particles

* E. Dale. "A Bacterial Disease of Potato Leaves." *Annals of Botany*, xxvi. (1912), p. 133.

(gravel, grit, and coarse sand) which ensure porosity and consequently warmth, nor in the finest materials (fine silt and 'klay') which secure retention of water"; and further, that "although a light soil of good physical composition (*e.g.* Thornton Loch) produces the best quality tubers in a moist climate, a heavy soil may do better in a warm dry climate. It is noteworthy that bruise has been frequently found in potatos attacked by wireworm on land only a short time brought into cultivation. In cases of this kind it is highly probable that the soil still requires a considerable amount of attention, and the treatment it receives should be considered relatively to the climatic conditions which obtain in particular districts.

The aim of the writer in this paper is merely to sort out and describe a form of disease which has hitherto been confused with others; a great deal more work on the subject remains to be done—notably (*a*) the study of a possible connexion between bruise and the phenomenon investigated by ASHBY (blackening after cooking); and (*b*) a more detailed investigation of the occurrence of solanin in the potato.

The writer desires to express his thanks to Mr. F. J. Chittenden, F.L.S., for his advice and criticism.

DESCRIPTION OF FIGURES.

FIGURE 20.—A. Typical example of bruise in a tuber of an unknown variety obtained from Devonshire in 1908. The mottled appearance on the right is the expression of the interwoven diseased and healthy cells. The vascular bundles are not discoloured.

B. Another example of bruise. The diseased area occurs on both sides of the ring of principal bundles which are not discoloured. The clean bundle area can be distinguished in the middle of the discoloured tissue.

C. Tuber of the variety 'British Queen,' with blackened flesh.

FIGURE 21.—A.–F. Examples of tubers of the varieties 'British Queen' and 'Sutton Flourball,' with blackened flesh. These form a series in the extension of the disease from the neighbourhood of the vascular bundles inwards.

REPORT ON THE METEOROLOGICAL OBSERVATIONS MADE AT THE SOCIETY'S GARDENS AT WISLEY DURING 1911.

By R. H. Curtis, F.R.Met.Soc.

From a meteorological point of view the year 1911 was a very remarkable one, and perhaps to no class of the community was it of more interest than to those whose concern lay in the garden and the field. To the dweller in the town the summer was glorious, but to those whose business it was to keep him supplied with water it was a time of disquiet and worry; whilst to the man who saw his pastures burnt up and his "roots" shrivelled it was without doubt a year of great anxiety. And yet, taking the year through, the various elements which combined to make up our "weather" gave averages not greatly different from the normal. The individual months were in some instances very remarkable, but the wonderful drought of the summer was balanced by the unusual rainfall of the later months, and the hot days of July and August failed to raise the mean temperature of the year by more than one and a half degrees. In contrast with the drought of the summer, when for eight weeks many districts were without rain except for two or three isolated showers, we had the floods of December, when the Thames Valley and large portions of Sussex and of other counties were under water for many days. The summer will, however, be long remembered; for in no previous summer for which we possess reliable records were there so many really hot days, and never before were such high temperatures recorded as were reached early in August, when the thermometer rose to 100° at the Royal Observatory at Greenwich, and to nearly as high a point all over south-eastern England. As regards rainfall, there were only three or four years during the last three-quarters of a century in which a smaller amount fell; and finally the record of bright sunshine was larger than in any year during the three decades in which a record of that element of climate has been kept.

The outstanding features of the weather of the year will be readily appreciated by a glance at the diagrams. The first shows the difference of the mean temperature and of the rainfall of each month from the average, and it will be seen that with the single exception of April the mean temperature exceeded the average from January to December, the largest excesses occurring in July and August and in December. On the other hand, the dryness of the year is shown by the fact that the only month which showed an excess until November was June, in which month, owing to local heavy falls, the average was slightly exceeded; in December the excess more than balanced the deficiencies in May, July, August, and September combined.

The sudden increase in the mean temperature is shown in figs. 22 and 25, as well as the rapid decline after August had passed. Fig. 24 shows

the marked predominance of the south-westerly wind current, and also the fact that it was exactly the opposite quarter that yielded the next largest number of observations of wind.

In fig. 23 the mean temperature of the air is compared with the

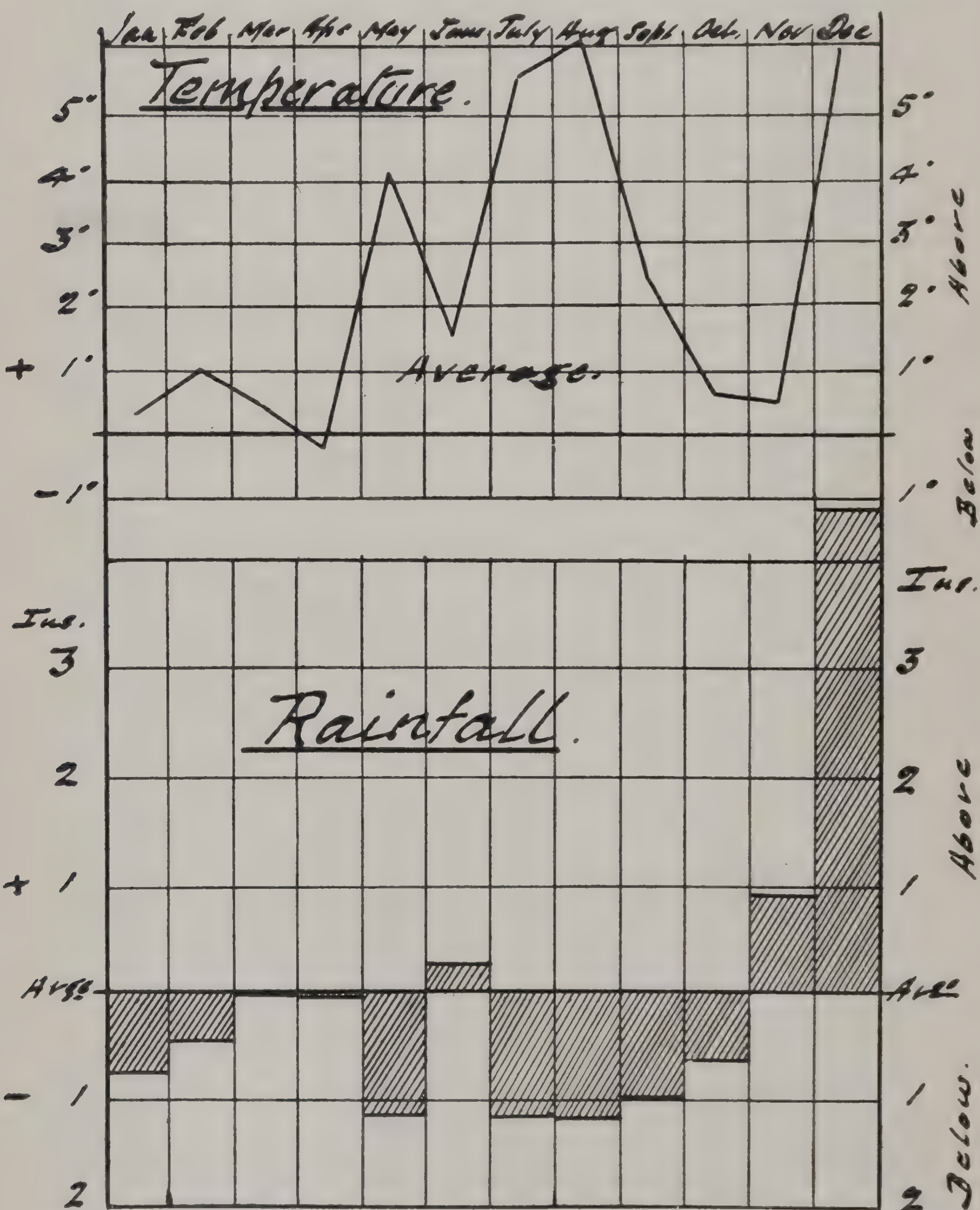


FIG. 22.—DIFFERENCES OF THE MONTHLY MEANS OF TEMPERATURE AND RAINFALL FROM THE AVERAGE.

mean temperature of the soil. The close agreement between the mean warmth of the air and of the soil at the depth of one foot is remarkable; the change of temperature at the lower depth is slower, and until August was passed it was cooler there than at the depth of one foot, but the more rapid cooling of the shallower layer brought its tempera-

ture down so that from September to the close of the year it was again several degrees lower than the deeper stratum.

The observations for the individual months are as follows:

January.—The opening month of the year was upon the whole both dry and warm, a combination which is not often found in winter in conjunction with an abnormally high barometer, such as existed throughout the month. But the distribution of the barometric pressure, by which the direction of the wind is governed, was such as to cause southerly and westerly winds, which were generally of light or moderate force, although now and again they rose to gale strength over the western portions of the kingdom. The rainfall over the

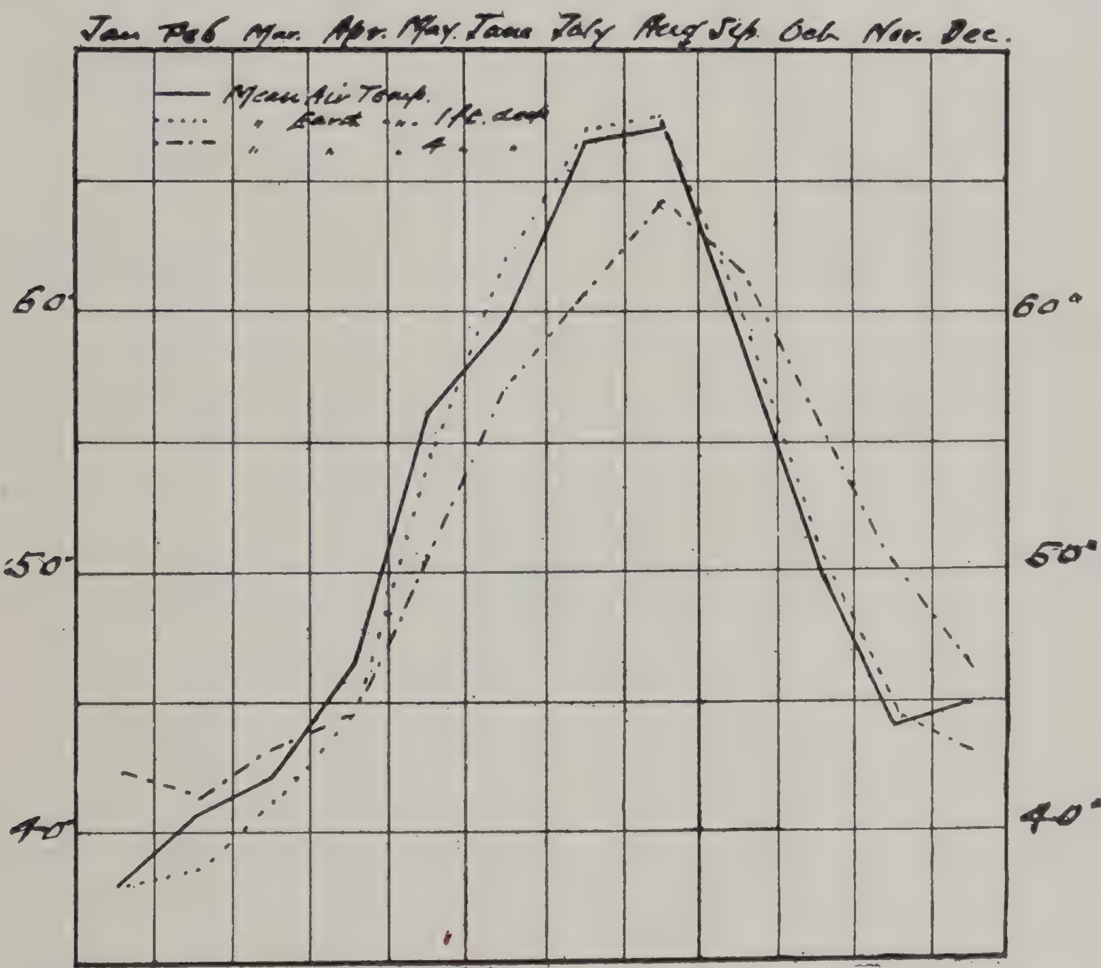


FIG. 23.—MEAN TEMPERATURE OF THE AIR, AND OF THE SOIL AT THE DEPTH OF ONE FOOT, AND OF FOUR FEET BELOW THE SURFACE, FOR EACH MONTH.

greater part of England varied from half an inch to an inch and a-half, and it was only in those parts of the kingdom which are normally the wettest that amounts exceeding 2 inches were recorded; the total precipitation over Ireland was probably less than half the normal amount, and in Scotland it did not exceed three-quarters. The first fortnight was the coldest period of the month, and some sharp frosts were experienced near the close of that time; but later the thermometer rose to 50° and upwards, and the nights being generally cloudy low night temperatures were rare. The amount of bright sunshine was in excess of the average in most parts of the kingdom, notwithstanding that there was also rather more than the normal amount of fog. At

Wisley the amount of sunshine recorded was about one-quarter of the total possible amount.

The results obtained from the observations taken at the Climatological Observatory in the gardens at Wisley are as follows:

Mean temperature of the air in shade	38°·1		
Highest " " "	53°·2 on the 28th		
Lowest " " "	23°·0 " 15th		
Lowest " on the grass	18°·0 on the 15th and 16th		
Number of nights of ground frost	17		
	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	38°·0	39°·5	42°·2
Highest " " "	43°·1	41°·8	43°·2
Lowest " " "	32°·9	36°·9	41°·9
Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100)	89 %		

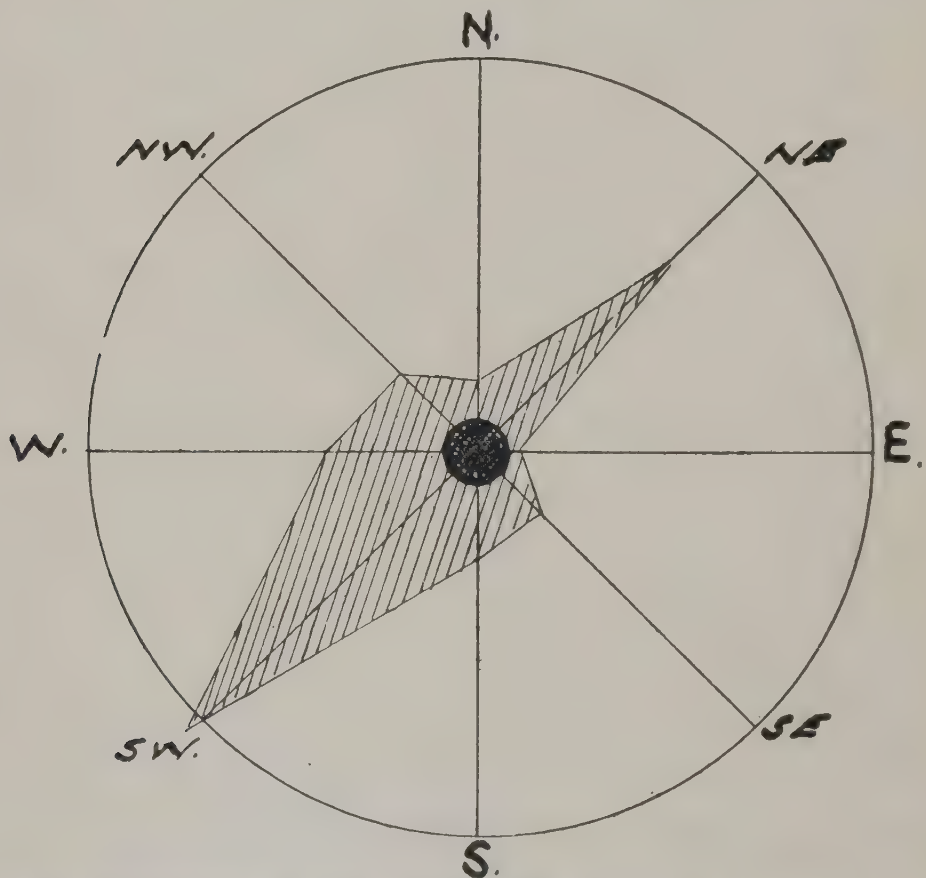


FIG. 24.—DISTRIBUTION OF WINDS DURING THE YEAR. THE RELATIVE FREQUENCY OF CALM IS SHOWN BY THE SHADED CIRCLE IN THE CENTRE.

Rain fell on 13 days to the total depth of ... ... 1·11 in.
(Equivalent to nearly 5¼ gallons of water to the square yard.)
Heaviest fall on any day ... ... 0·38 in. on the 11th
The prevailing winds were south-westerly.
The average velocity of the wind was 5½ miles an hour.
There were 59½ hours of bright sunshine, equal to 23 per cent. of the greatest possible amount.
There were 15 days on which no sunshine was recorded.

February.—The unusually high barometric pressure which governed the weather of January persisted throughout the first half

of February, the barometer rising to upwards of 30·8 inches, with light northerly winds and occasionally very low temperatures, 19° being recorded at Wisley in the screen and 12° by the thermometer exposed upon the grass. But before the middle of the month a change had set in, and the weather became affected by a series of

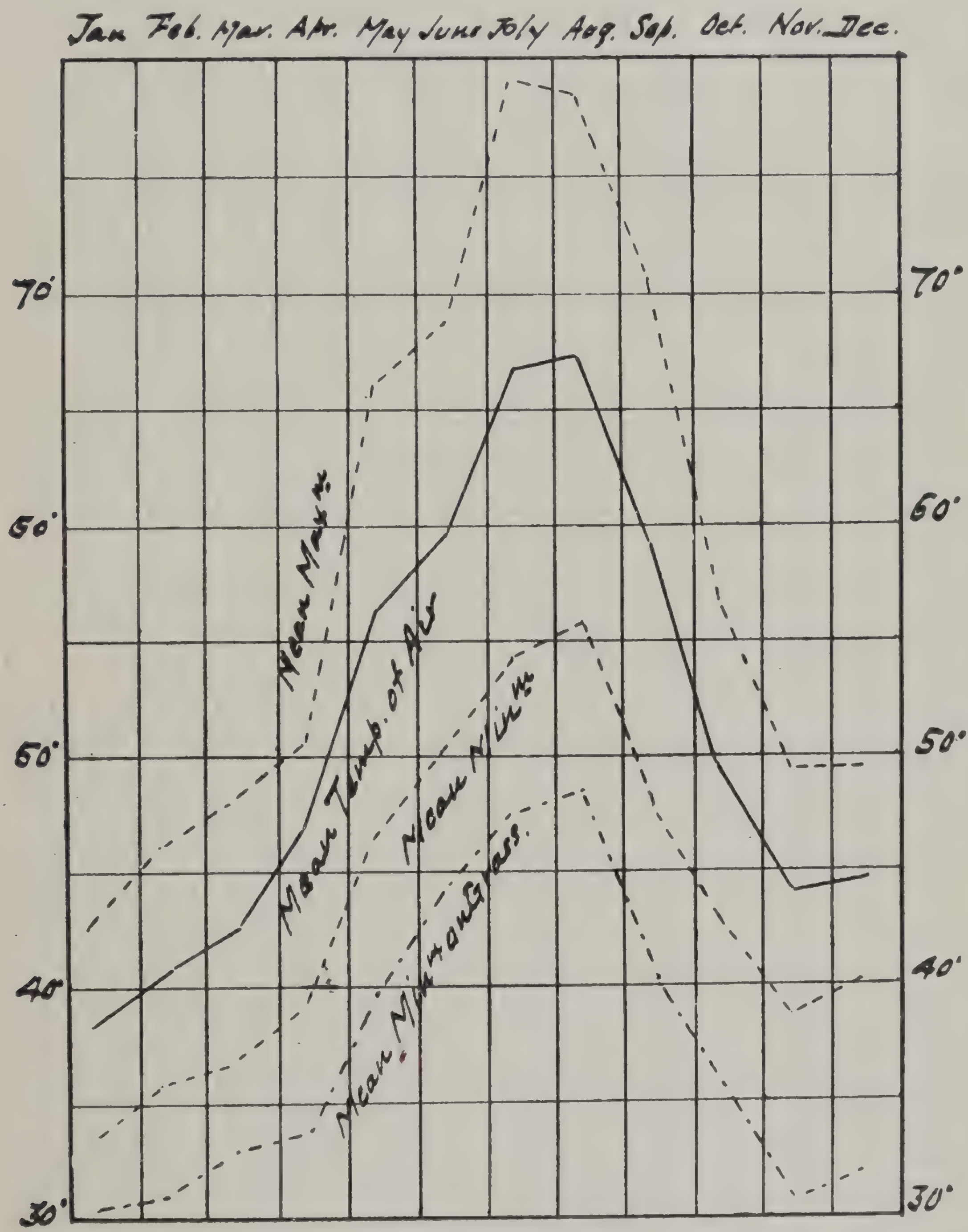


Fig. 25.—Mean Temperature of the Air; Mean Maximum and Mean Minimum Temperature of the Air; Mean Temperature on the Grass, for each Month.

atmospheric disturbances which skirted our north-western coasts, bringing very heavy rains to those regions, although all the eastern districts and central and southern England continued dry, and causing also a general rise of temperature. The weather generally had thus become unsettled and mild, and in spite of the cold at the beginning the mean temperature for the month was well above the average.

The amount of bright sunshine registered varied a good deal, but in several parts of the kingdom it exceeded the average, although not to a great extent. The rainfall at some places in the north-west exceeded the average by nearly 50 per cent., but over the greater part of the kingdom there was a large deficiency of rain, and scarcely any snow was seen anywhere.

The results from Wisley are as follows:

Mean temperature of the air in shade	40°·3		
Highest " " "	54°·5 on the 17th		
Lowest " " "	19°·0 " 1st		
Lowest " on the grass	12°·1 " 1st		
Number of nights of ground frost	13		
	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	38°·6	38°·8	41°·3
Highest " " "	43°·5	41°·9	42°·8
Lowest " " "	34°·3	36°·1	40°·4

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 86 %

Rain fell on 13 days to the total depth of ... ... 1·17 in.

(Equivalent to about 5½ gallons of water to the square yard.)

Heaviest fall on any day ... ... 0·27 in. on the 27th

The prevailing winds were westerly.

The average velocity of the wind was 8 miles an hour.

There were 72 hours of bright sunshine, equal to 26 per cent. of the greatest possible amount.

There were 11 days on which no sunshine was recorded.

March.—The early days of March were bright and warm, with a fresh westerly wind; but colder weather soon set in, and some rather low night temperatures were recorded by the thermometer on the grass, whilst during the day the highest readings of the thermometer in the screen were seldom above 45°. Throughout the latter half of the month there was a keen north-easterly wind, and the days were cool, but this was to a great extent compensated for by relatively warm nights, so that the mean temperature for the month was nearly normal. Over south-eastern England the amount of bright sunshine was small, but in the western, and especially the north-western, parts of the kingdom it was much larger. The month was decidedly dry, less than 2 inches of rain falling over a large part of central and southern England and over eastern Scotland and eastern Ireland, and less than 3 inches over the greater part of the remainder of the kingdom; very little snow fell anywhere. At Wisley a measurable amount of rain fell on fourteen days, and the total fall was less than an inch and a-half.

The results from Wisley are as follows:

Mean temperature of the air in shade	42°·2
Highest " " "	58°·8 on the 21st
Lowest " " "	29°·2 " 8th
Lowest " on the grass	22°·1 " 8th
Number of nights of ground frost	13

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	41°·3	41°·6	43°·1
Highest " " "	45°·2	44°·5	43°·9
Lowest " " "	37°·7	39°·8	42°·0

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 88 %
Rain fell on 14 days to the total depth of ... ... 1·47 in.
(Equivalent to about $6\frac{3}{4}$ gallons of water to the square yard.)
Heaviest fall on any day ... ... 0·44 in. on the 12th
The prevailing winds were north-easterly and south-westerly.
The average velocity of the wind was 8 miles an hour.
There were 75 hours of bright sunshine, equal to 21 per cent. of the greatest possible amount.
There were 10 days on which no sunshine was recorded.

April.—The month opened with a continuation of the cold north-easterly winds which had prevailed throughout the latter half of March, and with them the temperature decreased until about the end of the first week, when a frost unusually severe for the season was very generally experienced. In Scotland the screened thermometer fell many degrees below the freezing-point, and at Wisley 6° of frost were registered. On the ground, however, the exposed thermometer fell much lower, and in some southern districts early crops received some damage. On the 5th the maximum temperature at Wisley was only 34°, and it did not reach 37° on the 6th. Towards the middle of the month the wind-current changed to south-west and temperature conditions greatly improved, the thermometer rising on the 15th to about 65°, and the milder weather continued to the close. As regards rainfall, the month was decidedly wet over a considerable portion of Scotland, but dry over the eastern half of the kingdom, and average elsewhere; several places in eastern England had a deficiency of 50 per cent. Bright sunshine was in excess of the average over a considerable portion of southern England, but much below it over the greater part of the kingdom, and whilst in London City there were 131 hours, and at Wisley 155 hours, the total at several places in the north-west did not reach 100 hours. A little snow fell in the early days of the month.

The results from Wisley are as follows:

Mean temperature of the air in shade	46°·4
Highest " " "	65°·2 on the 15th
Lowest " " "	26°·3 " 6th
Lowest " on the grass	20°·1 " 12th
Number of nights of ground frost	11

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	44°·7	44°·5	44°·5
Highest " " "	50°·8	49°·0	47°·5
Lowest " " "	37°·6	39°·5	42°·6

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 78 %
Rain fell on 11 days to the total depth of ... ... 1·62 in.
(Equivalent to about $7\frac{1}{2}$ gallons of water to the square yard.)
Heaviest fall on any day ... ... 0·52 in. on the 1st

The prevailing winds were from north-east and from south-west.

The average velocity of the wind was 9 miles an hour.

There were 155 hours of bright sunshine, equal to 38 per cent. of the greatest possible amount.

There were only 2 days on which no sunshine was recorded.

May.—This was a warm and dry month, but with a considerable range in temperature between day and night, the screened thermometer at Wisley rising on one occasion to 75° in the day and falling to 46° at night, and on another to 66° and 36° respectively, and to 28° on the grass. But there were many bright, warm days, and the mean temperature for the month was generally high, and in some districts higher than any preceding May for many years. A meteorological feature of the month which is generally experienced is a cold period occurring somewhere near the middle, but on this occasion there was very little evidence of it anywhere. There was a very general excess of sunshine, the southern parts of England having an average of from seven to nine hours a day. Rainfall, on the other hand, was generally below the average, only a few parts of England receiving more than just over an inch. There were, however, some severe thunderstorms, the most severe being those which occurred over parts of the southern counties on the last day of the month, when falls of between 3 and 4 inches occurred in a few hours over portions of the North Downs between Dorking and Banstead. These were accompanied by electrical phen mena of quite unusual severity. At Wisley, however, the fall of rain on that day was slight, and for the entire month it barely exceeded 0·8 of an inch.

The results from Wisley are as follows:

Mean temperature of the air in shade	55°·9	
Highest " " "	77°·2	on the 29th
Lowest " " "	35°·8	" 22nd
Lowest " on the grass	27°·7	" 7th
Number of nights of ground frost		3

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	56°·4	52°·9	50°·5
Highest " " "	60°·6	57°·7	53°·9
Lowest " " "	49°·0	48°·6	47°·7

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 74 %

Rain fell on 8 days to the total depth of ... ... 0·83 in.
(Equivalent to about 3¾ gallons of water to the square yard.)

Heaviest fall on any day ... ... 0·34 in. on the 14th

The prevailing winds were westerly, but on a good many days north-easterly winds blew.

The average velocity of the wind was 4½ miles an hour.

There were 205 hours of bright sunshine, equal to 43 per cent. of the greatest possib amount.

There were 4 days on which no sunshine was recorded.

June.—The first week of this month was fine and warm, the temperature at Wisley rising on the 4th to 83°; but after the 9th the weather became cooler, and at night the thermometer on the grass fell

below the freezing-point on several occasions, and on the night of the 15th the temperature in the screen fell to 36°·4, and on the grass to 27°·4. These cold nights did some harm to vegetation, and on Wisley Common bracken shoots were killed by the ground frosts; but during the latter half of the month the ground temperature did not fall below 40°, and on the whole the temperature was about the average for the month, decreasing from about 60° over southern England to 54° in North Scotland. The first half of the month was rainless, but in the latter half there were several days of rain, the fall on three or four occasions being sufficiently heavy to soak the ground thoroughly, and, regarding the kingdom as a whole, the month was not unusually dry. The amount of bright sunshine was quite up to the average, and indeed in most districts above it, but whilst the southern counties had an average of about seven hours a day, the English Midlands had only about six. The winds blew from most points of the compass, and were frequently rather strong.

The results from Wisley are as follows:

Mean temperature of the air in shade	59°·5		
Highest " " "	83°·0 on the	4th	
Lowest " " "	36°·4 "	15th	
Lowest " on the grass	27°·2 "	14th	
Number of nights of ground frost			4

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	61°·9	60°·0	57°·1
Highest " " "	65°·5	62°·1	58°·0
Lowest " " "	58°·7	58°·0	54°·1

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 70 %

Rain fell on 11 days to the total depth of ... ... 2·02 in.
(Equivalent to about 9½ gallons of water to the square yard.)

Heaviest fall on any day ... ... 0·68 in. on the 23rd

The prevailing winds were from south-west to north-west, but north-easterly winds were experienced on several days.

The average velocity of the wind was 6 miles an hour.

There were 235 hours of bright sunshine, equal to 48 per cent. of the greatest possible amount.

There were 3 days on which no sunshine was recorded.

July.—The outstanding feature of the weather of July was the prolonged drought, accompanied by exceptionally hot and sunny weather, which was experienced over the greater part of the kingdom, and lasted for upwards of three weeks. The hottest days occurred at about the commencement of the second and fourth weeks, when maximum temperatures of about 90° were recorded at several places in England; at Wisley 88° was registered on the 8th, and 91° on the 22nd, whilst at the Greenwich Observatory on the latter date the thermometer rose to 96°. Sunshine was registered at Wisley on every day of the month, the daily amounts varying from four hours on the 1st to fifteen hours on the 13th, and averaging eleven hours a day. For three weeks no rain fell, and in many districts the total fall for the month was less than a quarter

of an inch; but over the whole of England and Wales, with the exception of a few places where thunderstorms were experienced, the fall was less than half an inch, and over eastern Scotland less than 2 inches. Over the western half of Scotland and the whole of Ireland the drought was less severe. There were some severe local thunderstorms, chiefly over south-eastern England, in the last week of the month, accompanied by torrential rains; at Wisley 0·94 fell between 5 A.M. and 7 A.M. on the 26th, and in London on the afternoon of the 28th 1·1 inch fell in a quarter of an hour. The weather of the month was excellent for haymaking, and by the close the harvest had begun all over the country.

The results from Wisley are as follows:

Mean temperature of the air in shade	66°·5		
Highest " " "	91°·1 on the 22nd		
Lowest " " "	45°·2 " 16th		
Lowest " on the grass	36°·0 " 11th		
	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	67°·0	64°·5	60°·7
Highest " " "	71°·7	68°·4	63°·9
Lowest " " "	60°·7	59°·8	57°·8

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 63 %

Rain fell on 6 days to the total depth of ... ... 1·25 in.

(Equivalent to about $5\frac{3}{4}$ gallons of water to the square yard.)

Heaviest fall on any day ... ... 0·94 in. on the 25th

The prevailing winds were between south-west and north-west.

The average velocity of the wind was $4\frac{1}{2}$ miles an hour.

There were 344 hours of bright sunshine, equal to 70 per cent. of the greatest possible amount.

There were no days on which no sunshine was recorded.

August.—The heat and drought which were such notable features of the weather of July continued to prevail throughout August also, and in an even more marked degree, the thermometer in the screen at Wisley rising to above 90° on three occasions, and to 96° on the 9th. On that day, however, such readings were general over the Midland counties and south-eastern England, and at Greenwich Observatory the record reading of 100° was recorded! The mean temperature for the month was therefore very high, and the daily range of temperature was also large, whilst the temperature of the soil at the depth of 1 foot greatly exceeded the average. Rainfall was again very slight—less than an inch over the southern two-thirds of England, except at a few isolated places, where local showers swelled the total, and less than 2 inches over the greater portion of the rest of the kingdom. Eastern Scotland and some portions of Ireland also had less than an inch during the month. The amount of sunshine was large, exceeding 60 per cent. of the total possible amount over the southern counties; at Wisley there was but one sunless day, and the daily amount averaged 8·2 hours. There was rather more wind than in July, but the force was never strong. The drought caused a very parched condition of the soil, and grass became quite burnt up.

The results from Wisley are as follows:

Mean temperature of the air in shade	67°·1		
Highest " " "	96°·2 on the 9th		
Lowest " " "	43°·2 " 31st		
Lowest " on the grass	37°·2 " 31st		
	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	67°·7	66°·6	64°·2
Highest " " "	70°·7	68°·3	65°·0
Lowest " " "	62°·2	63°·7	63°·2

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 72 %

Rain fell on 6 days to the total depth of ... ... 0·62 in.
(Equivalent to nearly 3 gallons of water to the square yard.)

Heaviest fall on any day ... ... 0·28 in. on the 28th

The prevailing winds were south-westerly, but on several days it blew from south-east or north-east.

The average velocity of the wind was 5 miles an hour.

There were 255 hours of bright sunshine, equal to 58 per cent. of the greatest possible amount.

There was only 1 day on which no sunshine was recorded.

September.—The wonderfully warm weather of July and August continued throughout the first half of September, and on the 8th the screened thermometer at Wisley rose to 91°, and to 93° at Greenwich Observatory and at a few other places in the south-east of England—the highest readings ever recorded there so late in the year. The latter half of the month was much cooler, and night frosts occurred several times, the thermometer on the grass at Wisley falling to 28°, and in the screen to 35° during the night of the 28th. The amount of bright sunshine continued to be large; at Wisley it averaged eight hours a day, and it exceeded the average all over the kingdom. The fall of rain was still much below the normal amount, and over the midland and southern counties, and also over the eastern half of Scotland and north-eastern Ireland it was generally well under 2 inches; at Wisley it amounted to only an inch, and fell on nine days. The depth of water in a well at Wisley which is regularly gauged had fallen to 5½ feet in July, and it continued at about that depth till the close of this month, instead of showing about 8 feet, as is usual throughout the summer; this indicated the excessive dryness of the soil, which made it difficult to carry out the ploughing and other operations usual at this season.

The results from Wisley are as follows:

Mean temperature of the air in shade	59°·1		
Highest " " "	91°·0 on the 8th		
Lowest " " "	35°·4 " 22nd		
Lowest " on the grass	28°·0 " 22nd		
Number of nights of ground frost			4
	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	60°·3	61°·3	61°·6
Highest " " "	65°·7	64°·5	63°·1
Lowest " " "	54°·7	57°·6	59°·0

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 70 %
Rain fell on 9 days to the total depth of ... ... 1·01 in.
(Equivalent to about $4\frac{3}{4}$ gallons of water to the square yard.)
Heaviest fall on any day ... ... 0·33 in. on the 13th
The prevailing winds were westerly.
The average velocity of the wind was 4 miles an hour.
There were 235 hours of bright sunshine, equal to 63 per cent. of the greatest possible amount.
There were only 2 days on which no sunshine was recorded.

October.—By the beginning of October the long spell of fine weather had quite come to an end, and there ensued a month in which the conditions were very nearly normal. Temperature was about the average, the highest reading at Wisley being just over 67° on the 12th; but as a rule the maxima were below 60°, and it was not until the 29th that a frost was recorded by the screened thermometer, although several ground frosts occurred in the first fortnight, and again in the closing week. The first half of the month was dry, but the latter half unsettled, with occasional heavy falls of rain; over the greater part of England the totals were between 2 and 3 inches, but in the south-east they ranged from 4 to 6 inches. Bright sunshine was less frequent than of late, but there were only nine days on which none was recorded at Wisley, and the total there was 28 per cent. of the possible amount for the month.

The results from Wisley are as follows:

Mean temperature of the air in shade	49°·6
Highest " " "	67°·4 on the 12th
Lowest " " "	27°·6 " 29th
Lowest " on the grass	19°·0 " 29th
Number of nights of ground frost	11

	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	50°·9	52°·8	55°·6
Highest " " "	54°·9	56°·6	59°·1
Lowest " " "	44°·1	48°·5	53°·0

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 88 %
Rain fell on 16 days to the total depth of... ... ... 2·96 in.
(Equivalent to about $13\frac{3}{4}$ gallons of water to the square yard.)
Heaviest fall on any day ... ... 1·30 in. on the 24th
The prevailing winds were north-easterly and south-westerly.
The average velocity of the wind was 5 miles an hour.
There were 91 hours of bright sunshine, equal to 28 per cent. of the greatest possible amount.
There were 8 days on which no sunshine was recorded.

November.—This was a boisterous month, due to the passage of frequent cyclonic depressions over our islands or in their immediate neighbourhood. Temperature was nearly normal; but with the strong southerly winds of the earlier days, and again near the middle of the month, there were some unusually warm days, when the thermometer rose to nearly 60 degrees. There were occasional frosts, but at Wisley the lowest point reached was only 27° in the screen and 18° upon the

grass—by no means unusual readings of the thermometer in November. Rainfall was above the average generally, but especially so in the south-eastern corner of England, as was the case in October. At Wisley $3\frac{1}{4}$ inches fell, but in Sussex and Kent the falls amounted to from 5 to 8 inches. Sunshine was about normal in amount, and averaged nearly sixty hours over the greater part of England, and ten hours more over the south-western counties. The winds were mainly from southerly and westerly points and occasionally blew very strongly. There was very little snow anywhere.

The results from Wisley are as follows:

Mean temperature of the air in shade	44°·0		
Highest " " "	58°·7 on the 4th		
Lowest " " "	27°·0 " 30th		
Lowest " on the grass	18°·2 " 22nd		
Number of nights of ground frost	14		
	At 1 ft. deep.	At 2 ft. deep.	At 4 ft. deep.
Mean temperature of the soil at 9 A.M.	44°·6	46°·3	50°·2
Highest " " "	50°·8	49°·8	52°·8
Lowest " " "	39°·1	42°·2	47°·0

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 86 %

Rain fell on 16 days to the total depth of... ... ... 3·26 in.
(Equivalent to about $15\frac{1}{4}$ gallons of water to the square yard.)

Heaviest fall on any day ... ... 0·69 in. on the 11th

The prevailing winds were south-westerly.

The average velocity of the wind was 8 miles an hour.

There were 61 hours of bright sunshine, equal to 23 per cent. of the greatest possible amount.

There were 6 days on which no sunshine was recorded.

December.—The outstanding features of the weather of this month were its storminess and the extraordinary rainfall which was experienced all over the kingdom. The mean temperature was generally above the average, but this was due to the high minima and to the small range of temperature rather than to any unusually high readings of the maximum thermometer; in the screen the thermometer rarely fell to the freezing point, and on the grass night frosts were infrequent and not severe. The weather was unsettled and boisterous all through the month, although the gales were not very violent. The fall of rain was excessive everywhere, and varied in amount from about 3 inches over a portion of eastern England to 10 inches in parts of Hampshire and Kent, nearly the whole of Devon and Cornwall, and Wales. In some of the normally wet districts the falls were very heavy, as, for example, at Borrowdale, where it amounted to 27 inches, and at Killarney, where it exceeded 12 inches. At Wisley the fall amounted to $6\frac{1}{4}$ inches, and a measurable amount fell on 25 days. As is not seldom the case when rainfall is excessive, the amount of bright sunshine was above rather than below the average, much of the rain falling at night; speaking broadly, over the southern counties and Wales there were from forty to sixty hours, and over the midlands and the eastern part of Scotland between twenty and forty hours.

The results from Wisley are as follows:

Mean temperature of the air in shade	44°·7		
Highest " " "	53°·4 on the 17th		
Lowest " " "	29°·1 " 8th		
Lowest " on the grass	17°·2 " 8th		
Number of nights of ground frost	14		
	At 1 ft. deep.	At 2 ft. deep.	At 4 ft deep.
Mean temperature of the soil at 9 A.M.	42°·9	43°·3	46°·2
Highest " " "	46°·5	45°·1	47°·0
Lowest " " "	39°·0	41°·5	45°·6

Mean relative humidity of the air at 9 A.M. (complete saturation being represented by 100) ... ... 91 %

Rain fell on 25 days to the total depth of ... ... 6·21 in.
(Equivalent to about 29 gallons of water to the square yard.)

Heaviest fall on any day ... ... 0·72 in. on the 10th

The prevailing winds were from south-east, south, and south-west.

The average velocity of the wind was 9 miles an hour.

There were 46 hours of bright sunshine, equal to 19 per cent. of the greatest possible amount.

There were 12 days on which no sunshine was recorded.

EFFECTS OF THE FINE SUMMER OF 1911 ON THE FLOWERING AND FRUITING OF PLANTS, SHRUBS, AND TREES OUT OF DOORS, MORE PARTICULARLY IN CORNWALL.

By WILSON LLOYD FOX, F.R.H.S., Carmino, Falmouth.

THE following list does not claim to be in any degree exhaustive, but it is hoped that a record of the flowering and fruiting of some of the species mentioned may prove of interest to horticulturists, and be of use, so far as it goes, for reference in future years. It is to be borne in mind that the heat in summer in Cornwall is not nearly so great as in many other parts of England, and therefore a few of the species which flowered or fruited unusually freely or for the first time out of doors may be in the habit of doing so elsewhere frequently.

Name.	Locality.	Remarks.
Acacia decurrens	Boslowick, near Falmouth	Fruited first time.
A. lophantha	Clay Point, Flushing, Falmouth	Podded more freely than usual (common elsewhere).
Aegle sepiaria (Citrus trifoliata)	Enys, near Penryn	Two fruits in 1910 and twelve in 1911.
Amaryllis Belladonna	Trelowarren, near Helston	Ripened its fruit for first time.
Aucuba Maddernii	Trewidden, near Penzance	Fruited first time.
Bignonia floribunda	Bosloe, near Falmouth	Flowered first time.
Cassia corymbosa	Tremedden, Falmouth	Bore several pods first time.
Castanea vesca (Spanish Chestnut)	Trebartha Hall, near Launceston	Chestnuts of remarkable size—quite as large as those imported.
Do.	Glendurgan, near Falmouth	Chestnuts abnormally plentiful and fine and of good marketable quality.
Chamaerops Fortunei	Treseder & Son's Nurseries, Truro	Fruited first time (common elsewhere).
Cotoneaster pannosa	Killiow, near Truro	Fruited very well.
Desfontania spinosa	Rosehill, Falmouth	Fruited freely.
Dianella laevis	Carclew, near Falmouth	Flowered very freely.
Edwardsia grandiflora	The Crossways, Falmouth	Flowered and fruited first time.
Elaeagnus pungens	Carmino, Falmouth	Fruits so numerous as to bend down the branches and many as large as a good-sized olive. The fruit ripened in February 1912.
Elaeagnus pungens var. aureus maculatus	Do.	Fruited first time.
Elaeagnus pungens variegatus	Morvah, Falmouth	Fruited first time. Fruits very numerous and large. Ripened in February 1912.
Do.	The Crag, near Falmouth	Fruited first time.
Do.	Glendurgan, near Falmouth	Fruited first time.
Erica codonodes	Carwinion, near Falmouth	Sowed itself along a path and about 100 seedlings sprang up.
Eriobotrya japonica (Loquat)	The Crag, near Falmouth	Flowered more freely than usual.
Do.	Whiddon, near Newton Abbot, Devon	Blossomed first time. Bush covered with blossom at Christmas.
Eucryphia cordata	Trewidden, near Penzance	Fruited unusually freely.
Eugenia Ugni	Carmino, Falmouth	Berried so profusely shrub subsequently died.
Feijoa Sellowiana	Carclew, near Falmouth	Flowered and fruited.
Freylinia cistrioides	Southleigh, Truro	Flowered very freely; having bloomed slightly previously.
Fuchsia procumbens	Rosehill, Falmouth	Fruited more freely than usual.
Gevuina Avellana	Trewidden, near Penzance	Fruited first time.
Holboellia (Stauntonia) latifolia	Rosehill, Falmouth	Fruited first time. Fruited at Tregothnan, near Truro, about five years ago. Fruited at Cofton Vicarage, Starcross, Devon, facing E., for 19 out of last 20 years.
Indigofera Dosua	Clay Point, Flushing, near Falmouth	Podded fairly freely and for first time.
Magnolia hypoleuca	Trewidden, near Penzance	Fruited unusually freely
Magnolia Lennei	Rosehill, Falmouth	Fruited more freely than usual and finer.
Mandevilla suaveolens	Lanarth, St. Keverne, Helston	Fruited first time (common elsewhere).
Do.	Lamellen St. Tudy, Wadebridge	Fruited freely.
Do.	Pengreep, Perranwell	Flowered more freely than usual.
Musa Basjo (japonica)	Trewidden, near Penzance	Fruited first time.

Name.	Locality.	Remarks.
Musa Cavendishii	Trengwainton, near Penzance	Fruited for second time.
Myoporum serratum	Rosehill, Falmouth	Fruited more freely than usual, being larger and with brighter colour.
Myrtle	Clay Point, Flushing, near Falmouth	Fruited freely. Berries larger and more fleshy than previously.
Do.	Duporth, St. Austell	Fruited exceptionally well.
Nandina domestica	Carwinion, near Falmouth	Had beautiful red berries first time.
Do.	Carmino, Falmouth	Fruited first time.
Photinia serrulata	Carwinion, near Falmouth	A tree which flowered first time.
Physianthus albens	Tregothnan, near Truro.	Fruited freely, which it had not done before (common elsewhere).
Pittosporum eugenioides var.	Trebah, near Falmouth	Fruited first time.
Pomegranate	Trewarthenic, Tregony	Ripened fruit on wall.
Quercus Ilex	Colyton House, Colyton, Devon	A tree somewhat less than 100 years old. During last 24 years has not been known to bear acorns that grew larger than a large shot, save once many years ago when the acorns were a little larger than a big pea and had rather a sweetish taste, being quite edible. Last summer the biggest acorns were about one inch long. Girth of tree at height of 2 feet above the ground was 11 feet 7 inches in December 1910.
Quercus pedunculata	Trebartha Hall, near Launceston	Enormous and unprecedented size of some of the acorns.
Rubus biflorus	Menehay, near Falmouth	Fruited first time.
Sciadopitys verticillata	Trewidden, near Penzance	Fruited unusually freely.
Semele (Ruscus) androgyna	Penjerrick, near Falmouth	Berried freely.
Solanum Balbisii	Rosehill, Falmouth	Fruited more freely than usual.
Solanum Capsicastrum	Trengwainton, near Penzance	Fruited very freely. Berries finer than usual and ripened early in autumn.
Sutherlandia frutescens	Clay Point, Flushing, near Falmouth	Fruited to a limited degree.
Viburnum macrocephalum	Trewidden, near Penzance	Fruited first time.
Viburnum Rhytidophyllum	Do.	Do.

AN ANALYSIS OF THE PEA TRIALS AT WISLEY, 1911.

By Frank R. Durham, A.M.Inst.C.E., F.R.H.S.

Data taken from Vol. XXXVII., Part 2, pp. 403-424.

The following general particulars regarding this trial may be noted:

The quantity of seed of each stock sown was half a pint.

On satisfactory germination the plants were thinned out to between 3 and 4 inches apart.

The seed was sown in rows running east to west, the ground sloping gently from south to north.

The expression "above ground" refers to the appearance of the first leaves.

The expression "ready to pick" refers to time when the row supplied a sufficient quantity for household purposes.

Two errors of printing occurred, and the corrections have been made for purposes of taking the averages. These misprints refer to:

(*a*) Stock No. 23, third sowing, the first flower date should be July 10 and not June 10.

(*b*) Stock No. 64, first sowing, the first flower date should be May 25 not April 25.

In the following analysis, all those stocks which either failed in the third sowing or gave unreliable data as to when they were "ready to pick" have been eliminated, in order that the sequence of comparison could be maintained. Further, such stocks which were grown in two or more samples have been accepted as only indicative of one stock in the averages. In other words, the 167 stocks are reduced to 155 distinct varieties, and of these ninety-two stocks are available for comparison.

These ninety-two stocks have been subdivided into four classes as follows:

80–90	day peas represented by	4 stocks	
91–100	,, ,, ,,	30 ,,	
101–110	,, ,, ,,	40 ,,	
111–120	,, ,, ,,	18 ,,	including two stocks over 120 days.

Before returning to the analytical examination, it may be well to re-state the dates of sowing:

1st sowing	March 8	
2nd ,,	April 21	or an interval of 44 days
3rd ,,	May 22	,, ,, 31 ,,

The stocks are referred to by their index numbers only; reference may be made to the original report for the names of the varieties.

In Table I. the ninety-two stocks have been tabulated, subdivided into the above classification, giving the intervals in days between the four stages of growth as well as the total number of days required for each sowing until the peas were "ready to pick."

TABLE I.

Number of days between the intervals of "sowing," "above ground," "first flower," and "ready to pick," as well as total number of days between "sowing" and "ready to pick."

1st sowing took place on March 8, 2nd sowing April 21, and 3rd sowing May 22, 1911.

Sowing	No. of Stock	No. of days between: Above ground	First flower	Ready to pick	Total days	No. of Stock	No. of days between: Above ground	First flower	Ready to pick	Total days	No. of Stock	No. of days between: Above ground	First flower	Ready to pick	Total days
1	42	23	55	12	90	52	26	52	19	97	5	26	61	23	110
2		15	33	20	68		14	34	18	66		17	39	24	80
3		9	26	21	56		9	26	30	65		11	38	14	63
1	112	23	55	9	87	64	26	52	19	97	9	26	59	25	109
2		14	34	187	66		15	34	19	68		17	35	24	76
3		9	26	21	56		9	26	23	58		10	37	18	65
1	116	26	52	12	90	90	26	56	16	98	13	30	49	24	103
2		14	34	16	64		21	28	31	80		15	33	29	77
3		9	26	21	56		11	31	19	61		9	30	22	61
1	125	23	55	10	88	91	26	52	19	97	15	26	58	19	103
2		19	29	18	66		12	37	17	66		19	34	27	80
3		9	26	23	58		9	28	19	56		10	36	19	65
1	1	26	52	15	93	100	26	53	19	98	18	23	56	26	105
2		19	28	29	76		17	31	21	69		15	33	19	67
3		10	27	19	56		11	28	19	58		10	29	20	59
1	2	29	50	20	99	101	23	55	19	97	21	26	58	19	103
2		17	31	28	76		15	33	18	66		19	31	26	76
3		10	30	18	58		9	26	21	56		9	38	16	63
1	3	26	56	16	98	104–5	24	54	14	92	22	26	56	27	109
2		19	29	28	76		17	31	18	66		20	32	28	80
3		10	32	16	58		9	28	21	58		12	33	14	59

Sowing	No. of Stock	No. of days between: Above ground	First flower	Ready to pick	Total days	No. of Stock	No. of days between: Above ground	First flower	Ready to pick	Total days	No. of Stock	No. of days between: Above ground	First flower	Ready to pick	Total days
1	63	26	53	24	103	148	31	48	26	105	107	29	56	27	112
2		17	31	22	70		19	29	22	70		19	33	28	80
3		11	29	21	61		10	27	22	59		9	40	16	65
1	68	27	52	31	110	149	26	53	24	103	110–1	26	60	25	111
2		15	33	22	70		19	29	21	69		19	37	20	76
3		10	30	16	56		15	26	19	60		11	38	16	65
1	71	23	55	25	103	150	26	56	28	110	122	26	62	37	115
2		19	29	19	67		19	29	28	76		19	29	20	68
3		10	27	19	56		9	31	20	60		10	32	17	59
1	77–8	26	52	27	105	152	26	56	28	110	135	26	56	30	112
2		14	34	30	78		19	29	28	76		19	31	34	84
3		10	27	24	61		10	35	20	65		10	37	12	59
1	79	26	56	21	103	158	26	52	25	103	138	27	57	27	111
2	80–1	17	31	21	69		19	29	22	70		19	29	30	78
3		11	33	14	58		10	29	19	58		10	32	21	63
1	95	26	53	26	105	160	27	59	27	103	139	33	50	30	113
2		15	33	28	76		15	34	32	81		17	32	33	82
3		9	33	18	60		11	35	19	65		12	35	16	63
1	163	27	57	19	103	14	26	56	29	111	151	26	60	29	115
2		15	39	22	76		19	30	27	76		19	31	34	84
3		9	36	18	63		9	40	16	65		11	35	17	63

1	6	26	52	19	97	113	26	52	21	99	24	26	58	19	103	106	26	60	19	105	23	26	61	33	120
2		22	27	27	76		17	31	18	66		15	35	27	77		19	34	27	80		20	29	33	82
3		11	28	17	56		10	30	16	56		11	36	13	60		9	40	16	65		11	38	16	65
1	12	26	56	15	97	118	26	52	20	98	33	26	52	25	103	109	26	60	24	110	26	26	60	27	113
2		13	36	17	66		17	31	20	68		19	30	21	70		19	34	27	80		17	37	27	81
3		10	29	24	63		9	28	22	59		9	31	19	59		11	36	16	63		11	38	16	65
1	28	23	59	18	100	132	26	52	19	97	37	26	52	27	105	117	26	52	25	103	29	30	55	27	112
2		14	34	22	70		14	34	18	66		11	37	18	66		17	31	21	69		15	38	24	77
3		9	36	13	58		9	26	21	56		9	27	20	56		10	30	18	58		9	37	17	63
1	32	26	56	15	97	140–1	23	55	18	96	45	26	60	24	110	162	26	58	26	110	34	38	46	37	121
2		19	29	19	67		14	34	22	70		17	37	26	80		19	31	30	80		17	32	31	80
3		10	35	18	63		9	26	21	56		9	38	18	65		12	33	18	63		10	35	18	63
1	35	26	52	19	97	146	26	52	19	97	40	26	52	25	103	133	26	58	26	110	38	27	63	22	112
2		14	34	19	67		14	34	18	66		17	31	21	69		19	34	24	77		17	35	28	80
3		9	28	19	56		9	27	22	58		9	29	18	56		10	27	16	63		9	41	15	65
1	36	26	52	19	97	155	26	52	19	97	39	26	58	26	110	134	29	56	20	105	47	26	60	25	111
2		11	37	18	66		22	26	25	73		19	33	28	80		14	40	22	76		15	38	27	80
3		9	26	21	56		10	28	21	59		10	36	17	63		9	38	18	65		9	38	18	65
1	43	23	56	19	98	156	26	56	18	100	58	29	56	25	110	136	26	60	17	103	53–54	26	63	33	122
2		15	33	20	68		17	31	29	77		15	41	20	76		19	34	25	78		18	33	35	86
3		11	31	18	60		10	35	18	63		9	37	17	63		10	39	15	64		9	42	37	88
1	48	23	55	19	97	157	23	55	19	97	59	26	52	25	103	137	31	51	28	110	56	29	58	25	112
2		17	31	18	66		17	31	21	69		17	39	15	71		17	31	22	70		19	37	24	80
3		10	26	20	56		8	28	23	59		11	29	18	57		10	30	23	63		9	38	18	65
1	50	26	52	19	97	159	26	52	19	97	60	30	49	25	103	144	26	60	17	103	72	27	55	33	115
2		11	37	20	68		14	25	17	66		15	33	19	67		19	34	27	80		17	31	28	76
3		9	28	19	56		11	28	20	59		11	26	19	56		11	38	16	65		10	35	18	63
1	51	26	52	20	98	115	26	56	18	100	61	23	61	19	103	142–3	26	52	25	103	97	26	61	26	113
2		14	34	20	68		13	35	21	69		19	36	22	77		15	33	28	76		19	40	25	84
3		10	25	21	56		9	33	16	58		9	40	16	65		9	30	20	59		10	41	15	66

indicates the division between the four classes of 80–90 day peas, 91–100 day peas, 101–110 day peas, 111–120 day peas, including two cases over 120 days.

This Table clearly indicates several facts, and the most striking is that, whereas the intervals between the first, second, and third sowing show a regular acceleration of germination which would be naturally expected and which is logical, the intervals for the production of the first flower and for being ready to pick show marked fluctuations. These fluctuations require further examination and trials in order to ascertain whether they really rest with the variety, or whether the influence of weather at the critical period made itself felt and has caused a retardation or acceleration of the fructification of the flower. It will therefore be of interest to record in detail the sunshine and days and hours of rain during the period of growth and fructification. They are as follows:

TABLE II.—SUNSHINE AND RAIN AT WISLEY: MARCH, APRIL, MAY, JUNE, JULY, 1912.

Day of Month	March		April		May		June		July		Day of Month
	Sunshine in hours	Rainfall in inches	Sunshine in hours	Rainfall in inches	Sunshine in hours	Rainfall in inches	Sunshine in hours	Rainfall in inches	Sunshine in hours	Rainfall in inches	
1	8·6	trace	·1	·52	10·5	—	12·4	—	3·9	·01	1
2	2·5	—	—	·27	—	·20	14·1	—	11·6	·05	2
3	1·0	—	4·7	trace	4·8	·11	10·4	—	12·0	—	3
4	—	·05	4·8	·05	11·6	—	13·1	—	10·9	—	4
5	7·0	—	5·6	trace	6·7	—	12·6	—	7·9	—	5
6	—	·14	4·8	—	9·8	—	12·0	—	14·3	—	6
7	·9	—	5·5	·01	10·5	—	12·2	—	11·4	—	7
8	1·1	·18	1·4	—	12·0	—	13·9	—	10·3	—	8
9	4·2	·06	—	trace	12·6	—	7·7	—	11·2	—	9
10	3·4	·07	1·4	—	7·1	—	11·3	—	9·7	—	10
11	—	trace	2·0	—	5·5	·01	9·3	—	13·0	—	11
12	—	·44	6·8	—	4·8	—	2·9	—	14·6	—	12
13	5·6	·04	9·3	—	8·3	·07	10·1	—	15·1	—	13
14	·8	trace	10·0	—	1·0	·34	12·4	—	13·7	—	14
15	·4	·10	10·1	—	1·2	—	12·4	—	5·2	—	15
16	1·9	—	2·8	—	2·5	—	2·4	·50	13·6	—	16
17	2·0	·01	7·1	—	3·4	—	6·0	·02	7·8	—	17
18	—	—	4·7	·01	8·3	—	9·8	·04	10·9	—	18
19	—	—	11·0	—	4·1	trace	1·0	·28	10·2	—	19
20	6·3	·01	9·8	—	—	—	9·5	trace	6·3	—	20
21	4·3	—	·1	—	—	—	3·0	—	14·1	—	21
22	3·8	·21	9·5	—	11·8	—	—	·04	13·9	—	22
23	—	—	1·9	—	10·3	—	1·2	·68	10·3	—	23
24	1·1	·02	11·0	—	4·5	—	7·6	·11	11·1	trace	24
25	7·7	—	1·4	·02	8·6	·01	—	·09	11·9	·94	25
26	2·2	·04	8·6	·14	—	·02	3·3	·04	7·4	·07	26
27	—	·10	2·7	·02	6·5	—	9·8	—	14·5	·07	27
28	8·9	trace	6·3	·22	13·2	—	11·5	—	11·2	—	28
29	—	—	3·9	·34	13·6	—	3·5	·20	10·0	·11	29
30	—	trace	7·7	·02	7·3	trace	—	·02	12·0	—	30
31	1·0	—	—	—	4·8	·07	—	—	14·0	—	31
Totals	74·7	1·47	155·0	1·62	205·3	·83	235·4	2·02	344·0	1·25	

The main facts may be summarized as follows:

The interval between "above ground" and "first flower" was longer in the third sowing than in the second.

In the case of the 80–90 days peas 0 times or 0 per cent.
" " " 91–100 " " 7 " " 23 " "
" " " 101–110 " " 18 " " 45 " "
" " " 111–120 " " 16 " " 89 " "

The interval between "first flower" and "ready to pick" was longer in the *second* sowing than in either the first or third sowing.

In the case of the	80–90 day peas	0 times or	0 per cent.
,, ,, ,,	91–100 ,, ,,	14 ,,	47 ,, ,,
,, ,, ,,	101–110 ,, ,,	20 ,,	50 ,, ,,
,, ,, ,,	111–120 ,, ,,	7 ,,	39 ,, ,,

The interval between "first flower" and "ready to pick" was longer in the *third* sowing than in either the first or second sowing.

In the case of	80–90 day peas	4 times or	100 per cent.
,, ,,	91–100 ,, ,,	12 ,,	40 ,, ,,
,, ,,	101–110 ,, ,,	0 ,,	0 ,, ,,
,, ,,	111–120 ,, ,,	1* ,,	5 ,, ,,

On the other hand, there are four cases in 101/110 day peas in which the interval at the third sowing was longer than the second.

It appears that there is no case where a retardation has occurred simultaneously in the intervals between "above ground" and "first flower," and "first flower" and "ready to pick," but that any retardation is made up for in an acceleration in either of the intervals.

In the following Table III., the averages for each class have been obtained and the maximum and minimum intervals noted. The last two periods do not necessarily refer to the same stock.

TABLE III.

Maximum, Minimum and Average Intervals, as well as Total Average Interval between "Sowing," "Above Ground," "First Flower," and "Ready to Pick."

Sowing.	Above Ground.			First Flower.			Ready to Pick.			Total Days.
	Max. Interval	Min. Interval	Average Interval	Max. Interval	Min. Interval	Average Interval	Max. Interval	Min. Interval	Average Interval	
80/90 day peas (4 stocks)										
1	26	23	$23\frac{3}{4}$	55	52	$54\frac{3}{4}$	12	9	$10\frac{3}{4}$	$89\frac{1}{4}$
2	19	14	$15\frac{1}{2}$	34	29	$32\frac{1}{2}$	20	18	18	66
3	9	9	9	26	26	26	23	21	$21\frac{1}{2}$	$57\frac{1}{2}$
91/100 day peas (30 stocks)										
1	26	23	$25\frac{1}{2}$	59	50	$53\frac{1}{2}$	21	14	$18\frac{3}{4}$	$97\frac{1}{4}$
2	22	11	$15\frac{3}{4}$	37	25	31	31	17	$20\frac{3}{4}$	$67\frac{1}{2}$
3	11	8	$9\frac{1}{4}$	35	25	28	24	13	$19\frac{3}{4}$	57
101/110 day peas (40 stocks)										
1	31	23	$26\frac{1}{2}$	61	48	$55\frac{1}{2}$	25	17	$24\frac{1}{2}$	$106\frac{1}{2}$
2	20	11	$17\frac{1}{2}$	41	29	$33\frac{1}{4}$	32	15	$24\frac{1}{4}$	75
3	15	9	$9\frac{1}{2}$	40	26	$32\frac{3}{4}$	24	13	18	$60\frac{1}{4}$
111/120 day peas (18 stocks)										
1	33	26	$27\frac{3}{4}$	63	46	$58\frac{3}{4}$	37	22	29	$115\frac{1}{2}$
2	20	15	18	40	29	$33\frac{1}{2}$	34	20	$28\frac{1}{4}$	$79\frac{3}{4}$
3	12	9	10	42	32	$36\frac{1}{4}$	37	12	$17\frac{1}{4}$	64
Excluding the two stocks exceeding 120 days Nos. 34 and 53, 54.										
1			$27\frac{3}{4}$			58			$28\frac{1}{4}$	114
2			18			$34\frac{1}{4}$			$27\frac{1}{2}$	$79\frac{3}{4}$
3			10			37			$16\frac{1}{2}$	$63\frac{1}{2}$

Table III. bears out in a marked way the acceleration and retardations in the different intervals, and it can be seen that in the case of

* This was the case of the 122-day pea, a selected 'Gladstone.'

the 91/100 day peas the average interval between "first flower" and "ready to pick" in the second sowing was longer than in the first and third. Again, in the 111/120 day peas it is clear that the interval between "above ground" and "first flower" was longer in the third sowing than in the second sowing. In order to make these facts still clearer a fourth table of retardation, signified by the + sign, and acceleration, signified by the − sign, has been drawn up.

TABLE IV.—RETARDATION AND ACCELERATION IN DAYS.

Retardation (+) or Acceleration (−) between	First Sowing				Second Sowing				Third Sowing			
	Above ground	First flower	Ready to pick	Total	Above ground	First flower	Ready to pick	Total	Above ground	First flower	Ready to pick	Total
80–90 and 91–100 day peas	+1¾	−1¼	+7½	8	+¼	−1½	+2¾	+1½	+¼	+2	−1¾	+½
91–100 and 101–110 day peas	+1	+2	+6¼	9¼	+1¾	+2¼	+3½	+7½	+¼	+4¾	−1¾	+3¼
101–110 and 111–120 day peas	+1¼	+3¼	+4½	9	+½	+¼	+4	+4¾	+½	+3½	−¼	+3¾
80–90 and 111–120 day peas	+4	+4	+18¼	26¼	+2½	+1	+10¼	+13¾	+1	+10¼	−3¾	+7½

From the above table it appears that the retardation is not so strongly exhibited in the period of germination as in the period of fructification, but it is of interest to note that in third sowing there is in every instance an acceleration in the period of fructification, so that the total difference is only seven and a half days. It would have been of interest if the sowings had been increased to at least five, and then a complete curve might have been obtained indicating the probable return of the produce when sowings were made at certain fixed dates.

Conclusion.—Undoubtedly had not the third sowing failed in so many cases (sixty-three in all), further interesting facts might have been obtainable. But it does appear from the above that a case is made out for the repetition of the trials in order to confirm the above figures, and to extend the sowings over further periods. By such further trials results might be obtainable to guide hybridizers to attempt to obtain varieties which would bear fruit quicker, as it is obviously the period of fructification which requires shortening in order to bring the late peas safely to fruit independently of the climatic conditions.

HIPPEASTRUM FORGETII [SP. NOV.]

By A. Worsley, F.R.H.S.

Salisbury's sub-genus *Omphalissa* is distinguished by the short tube closed in by a distinct neck at the throat. It contains several species, of which six have been described; of these all but *Hippeastrum Cybister* have been at some time fairly common in cultivation in European gardens. *H. aulicum*, *H. organense*, *H. calyptratum*, and *H. psittacinum* are widely distributed in South and Central Brazil, and are, under some conditions, epiphytal in their habits. I have known *H. calyptratum* and forms of *H. organense* to cling to the bald surface of the rock in the Organ mountains, and the latter species has also been reported as growing on tree-stems in the forest regions. Another section of this sub-genus comes from the high lands of Peru and Bolivia, and is represented in our gardens by *H. pardinum*.

It is with these upland western forms that the species I here describe is allied. It is by no means a conspicuous or showy plant, nor does it differ much in general aspect or coloration from the ubiquitous *H. rutilum*, but it possesses in a very marked degree the botanical characteristics of the sub-genus *Omphalissa*. Hence it must be separated by botanists from all its nearest allies in colour and general appearance, and be grouped with *H. pardinum*.

From the forms of *H. pardinum* introduced into cultivation by Messrs. Veitch and others between 1867 and 1883, it differs in a few particulars, notably in the fact that the flowers are sub-vittate in their coloration, and are unspotted, with generally narrower segments. But the distinctness of these characters disappears in certain intermediate forms, which, however puzzling to classifiers, leave no doubt of the alliance of *H. Forgetii* with *H. pardinum*. Nor can one specific name be well extended to include all these forms, for *H. pardinum* is known to come true from seed and without casting any undue number of variant seedlings. Hence it is probable that *H. pardinum* is a good species, and that the bulbs introduced into our gardens were not merely spotted individuals belonging to a typically unspotted species. Yet, on the other hand, colour-markings do not constitute a specific trait, and it may be that the spotted forms (*pardinum*) are but a variety of the immaculate forms (*Forgetii*), and that the spotting is linked with some morphological changes.

It is to Mr. Louis Forget that I am indebted, through the kindness of Messrs. Sander & Sons, for the opportunity of growing and comparing plants of both these species from the same importation. Some of the *pardinum* types carried fine flowers of the variety known as *H. pardinum tricolor*, and bulbs of *Urceolina aurea* and *U. miniata* were included in the same importation. The bulk of the Hippeastrums sent in this importation seem to have been unspotted, and

to have shown very little variation. Hence it appears as though "hundreds" of *H. Forgetii* were gathered, and only a few of *H. pardinum tricolor*. Mr. Louis Forget gathered these bulbs himself, near Cuzco, on September 23, 1909.

DESCRIPTION AND COMPARISON.

	H. Forgetii	*H. pardinum tricolor.**
Bulb	Rather small.	Rather small.
Neck	3 inches long.	$3\frac{1}{2}$ inches long, with rough tunics.
Leaves	6, contemporaneous with inflorescence, lanceolate-tipped, dull light green, ruddy on back. Ultimately 2 feet long by $1\frac{1}{2}$ inch maximum width.	5, contemporaneous with inflorescence, not then fully grown but already nearly 2 feet long by $1\frac{3}{8}$ inch maximum width, deeply channelled below, deep shining green.
Scape	Two-flowered, slender, about 2 feet high.	Two-flowered, $2\frac{1}{2}$ feet high, slender.
Pedicels	3 inches long = the spathe-valves.	2 inches long, shorter than spathe-valves.
Flowers	Stellate with the general colouring of *H. rutilum*, dull crimson distinctly keeled in the lower half with a green keel. Base green. Span 6 inches by $5\frac{1}{2}$ inches horizontally. Limb $4\frac{1}{4}$ inches. Scentless.	General resemblance to *H. tricolor* of Rev. Dombrain [in Flor. Mag., 344] but regularly tricolored rather than variegated with irregular red splashes; widely expanded with slightly drooping pose; scentless. Limb $4\frac{1}{4}$ inches.
Segments	The 3 outer slightly incurved at the apices, 4 inches long by 1 inch maximum width, the inner slightly narrower, the lowest $3\frac{1}{2}$ inches long by $\frac{3}{4}$ inch maximum width.	The 3 outer much longer than the rest, the lowest inner the shortest of all. Outer segments, 4 inches long by $1\frac{1}{2}$ inch to 2 inches maximum width; inner segments, $3\frac{1}{2}$ inches long by $1\frac{1}{2}$ inch wide, the lowest inner segment only $3\frac{1}{4}$ inches long by less than $1\frac{1}{4}$ inch wide.
Tube	Under $\frac{1}{4}$ inch long, otherwise same as in *H. pardinum tricolor.*	$\frac{1}{4}$ inch long completely closed by the incurved bases of the stamens, the throat bearded by tufts of white hairs $\frac{3}{8}$ inch long growing on an obscure green corona.
Stamens	Contiguous, very little if at all exserted.	Somewhat spreading, exserted about an inch.
Pollen	Yellow.	Very scanty and apparently imperfect.
Style	Exserted $\frac{1}{2}$ inch beyond the lowest segment.	Longer than the stamens and exserted fully $1\frac{1}{4}$ inch beyond the lowest segment.
Stigma	Three lobed.	Obscurely capitate, simple.
Fruit	Sub-triquetous. Ovules normally seated, about 75 in all (25 in each row).	Sub-triquetous. Ovules normally seated, about 90 in all (30 in each row).

* Note on colour-markings of *H. pardinum tricolor.*—The exceptional coloration of the flowers is due to the parti-coloured ground upon which the chequered markings

The following varieties appeared in this importation. Vars. A and B were clearly varieties of *H. Forgetii*, but Var. C was substantially *H. pardinum*, but with the coloration of *H. Forgetii.*

Var. A. Flower of an intense dark red, with narrower segments, and a very short green star.

Var. B. Irregularly blotched with white at the apices of all segments [this may have been due to some injury whilst in bud].

Var. C. An inflorescence substantially *H. pardinum* but unspotted. The flowers larger than in *H. Forgetii* and with a larger green base. Limb exceeding 4 inches; span exceeding 6 inches by 5 inches horizontally; outer segments $1\frac{3}{4}$ inch wide; inner segments $1\frac{1}{2}$ inch wide; lowest less than 1 inch wide and shorter than all the rest; stamens exserted; style $\frac{3}{4}$ inch longer than stamens; stigma sub-capitate, simple. The flowers were very widely expanded (as in *H. pardinum*) with no inclination for the apices of the outer segments to incurve (as in *H. Forgetii*). The dissection of the tube showed similar results. Ovules about 81 (27 in each row).

My thanks are specially due to Mr. Godseff, on behalf of Messrs. Sander, for providing me with such ample material from which these particulars were prepared. *H. Forgetii* has now flowered with me twice, and a flower-spike was shown before the Scientific Committee of the R.H.S. on February 6, 1912. (See p. xxxii.)

appear. Thus the general ground-colour is a dullish crimson chequered with white, but on the lowest segment and on the adjoining halves of the two nearest segments the ground-colour is white, irregularly spotted with a few red spots in places. All the segments have green bases, and the 3 upper segments have in addition a short distinct green keel below. The exterior of the flower is whitish and greenish chequered with red.

WATTLE CULTIVATION.

By F. H. Seed, F.R.H.S.

Much interest seems to be taken now in British East Africa and in other places with a similar climate with regard to Wattle growing.

The term "Wattle" throughout Australia is applied generally to all species of *Acacia*, over one hundred species of which are native in New South Wales alone. "Sydney Wattle" (*Acacia decurrens*) grows to a height of from about thirty to sixty feet and produces a most important tan-bark. It is generally considered that Wattles will thrive on soil which is of little use for other cultivation, but at the same time the tannin will be found inferior if grown on poor soil, and as with all other crops the better the cultivation the better the yield and profit. In sowing the seeds, three to five should be placed four feet apart, which will allow for thinning out, and care should be taken not to cover the seeds too deeply. If, however, only a small area is to be planted it is much better to raise seedlings in a nursery, and from my own experience both in British East Africa and in the Cape I have found nurseries answer the best, if the cost of labour will allow. On the other hand, if sowing broadcast, be careful to sow sparingly, otherwise the cost of thinning may be a loss instead of a gain. Many planters recommend that the seedlings be thinned out as soon as big enough to handle, say, from ten to twelve feet apart, but there are many differences of opinion, and one thing is certain, namely, that close planting gives "leggy" trees.

In five years it is considered a fair return to get eight tons to the acre. The thinnings alone of an ordinary plantation should realize at least £4 from an acre after three years. The method of export and packing highly recommended throughout Australia is by chopping the bark into pieces a few inches in length and selling in bags. The powdering of this bark is preferred by the trade, but adulteration is not unknown when this method is resorted to, and during my experience with Wattle plantations in Cape Colony chopping and bagging were the general rule.

I have by me the figures of five analyses of Wattle bark, taken in New South Wales, which run as follows: 33·03, 35·08, 32·13, 37·56, and 33·33 per cent. of tannin respectively. When we consider that many plantations in Cape Colony yield from 22·26 per cent. of tannin, and Natal 30 per cent. to 34 per cent., we may take it that there is a good future for Wattles in British East Africa, judging by the report that a shipment of bark recently sent home showed 42·2 per cent. of tannin, and is only topped by the South Australian Wattle (*Acacia pycnantha*), one of the richest, if not the richest, tanning barks in the world, showing 46·47 per cent. of tannic acid.

In Australia a full-sized tree will give about 100 lb. of bark, at about seven years old, while we may reckon upon half that amount in the fourth year. Generally speaking, Wattles require a cool district, and will not give such good results near the coast. I noticed some very fine Black Wattle trees in South Queensland, but was told that although they grew so large they were not of much commercial value, ten per cent. of tannic acid being the average yield for a matured tree, which goes to show that although the tree may grow well and *appear* all that is desired in many kinds of land and climates, we have to prove by actual results the most suitable soils and situations to render it a good commercial undertaking for tanning purposes.

COMMONPLACE NOTES.

By the Secretary, Superintendent and Editor.

The Venerable Archdeacon Donne sends us the photograph (fig. 26) of a fine plant of *Primula malacoides* grown within the smoke area of Wakefield. His gardener, Mr. R. Simpson, contributes the following note on its cultivation, which is very simple: "Sow the seed, in March or April, in pans, in a mixture of loam, leaf-mould, and sand put through a fine sieve. Water before sowing the seed, which must be spread evenly over the surface and barely covered with fine soil. Place a sheet of glass over the pans, and over this a sheet of brown paper kept moist. Stand in cool greenhouse, and as soon as germination takes place gradually give them more light and air. Great care must be taken at this period that the soil does not become too dry. When the seedlings are large enough to handle, prick them out into boxes or pans about three inches apart, shade for a few days, and then grow on as near the glass as possible. When large enough transfer into three- or four-inch pots, using a compost of loam, leaf-mould, and sand put through a half-inch sieve. After they have taken hold of the fresh soil stand them out in a cold frame, giving plenty of air and shade from very hot sun. About the end of September bring them into the greenhouse and place on a shelf as near the glass as possible, still giving plenty of air on favourable occasions. By careful attention to watering, which is a very important factor in the success of these Primulas, they will soon make sturdy plants suitable for table decoration, looking extremely well under artificial light, or as cut bloom in vases, as well as making a delightful show in the greenhouse from October until April, throwing up flower, tier upon tier, in most wonderful profusion, until you have plants carrying from twenty-five to forty spikes of white, lilac or pink flowers most sweetly scented. If larger plants are desired, the plants may be potted into five- or six-inch pots, but we find the three- or four-inch the most useful for all purposes. For growing on a second season, they may be re-potted after flowering, and fine plants can be had by the following winter. To anyone who has not given this Primula a trial we strongly recommend it, the main points to remember being cool treatment, growing near the glass, and careful watering."

Strelitzia Reginae.

Miss Francis Carnegie Wemyss kindly sends us a photograph (fig. 27) of an excellent specimen of the curious and gorgeous 'Bird of Paradise' flower, flowering well in her garden at Canterbury. The plant had been grown in a warm greenhouse, which Mr. Read, under whose charge it has been, informs us is kept at about 50° to 55° F.

Fig. 26.—Primula malacoides.

[To face p. 78.

Fig. 27.—Strelitzia Reginae.

during the winter. The species of the genus are all large perennial herbaceous plants of South Africa, the present one, *Strelitzia Reginae*, being about 5 feet in height. Most of the species have striking flowers, but this is the most magnificent of the genus, with its brilliant large orange and purple flowers and its fine ovate green leaves. Several varieties are known, and the one figured apparently belongs to the variety *prolifera* from its habit of producing a second sheath on the same scape. Though the type was introduced as long ago as 1773, the plant is, even now, not frequently seen.

BOOK REVIEWS.

"Rock Gardens and Alpine Plants." By E. H. Jenkins, F.R.H.S. Edited by T. W. Sanders. 8vo. 143 pp. (Collingridge, London, 1911.) 2*s*. 6*d*. net.

This is a little book on the subject of rock gardens and alpine plants which will give the beginner useful hints as to how to make a rockery and what to plant. There are comprehensive lists at the end of the book of varieties and their requirements as regards soil. Some good advice is given as to the proper care of alpines and their cultivation under various conditions. A little more information as to the requirements of bulbs for alpine gardens would have made the book even more valuable.

"Among the Hills, a Book of Joy in High Places." By Reginald Farrer. 8vo. 326 pp. (Headley, London, 1911.) 10*s*. 6*d*. net.

A new book by Reginald Farrer is always an event of interest to the grower of alpine plants, whether he be professional or amateur. Mr. Farrer takes us with him on an excursion in the summer of 1910 through the Graian, Cottian, and Maritime Alps in search of alpine plants in their native haunts, and has produced a volume which must add greatly to the knowledge of the alpine plant cultivator. Whether it be on the high pastures of the Mont Cenis, in the hot valleys of the Cottian Alps, or on the granite ridges of the Alpes Maritimes, we follow Mr. Farrer in his quest with unabated zest and pleasure. To all lovers and growers of alpines this book will be of real and abiding value, while even to those who are not the author's enthusiasm is infectious. Mr. Farrar's likes and dislikes are fierce, whether of men or plants, his praise is often exaggerated, and his blame is not always warranted; but he has given us a book of solid worth, without a dull page in it, and we lay it down with regret. Mr. Soper's illustrations perform well the difficult task of giving a real picture of the plants as they are seen at their best, and we only regret there are not more of them. Especially would we welcome pictures of *Saxifraga florulenta* and *Viola nummularifolia*.

"The Flower-Fields of Alpine Switzerland. An Appreciation and a Plea." Painted and written by G. Flemwell. 8vo. 195 pp. (Hutchinson, London, 1911.) 7*s*. 6*d*. net.

This is a book that aims to give us a picture of alpine plants in their native haunts, notably those of the high pastures, but somehow does not quite accomplish its aim. The author's plea for the establishment of alpine flower-fields in England, even as adjuncts to rock gardens, will, we think, appeal to but few. Mr. Flemwell's illustra-

tions are good and attractive, and make one wish to see the wealth of flowers in the Alps. Mr. H. Correvon writes an appreciative preface, but on the whole we are inclined to think that the volume does not add much to our knowledge.

"The Naturalist in Nicaragua." By Thomas Belt, with an introduction by Anthony Belt, F.L.S. 8vo. 306 pp. (Dent, London.) 1*s*. net.

Readers with a taste for books on travel and natural history are greatly indebted to Messrs. Dent for including in their admirable "Everyman's Library" Belt's well-known work, "The Naturalist in Nicaragua." First published in 1874, this work appeared to Darwin to be "the best of all natural history journals that have ever been published." It also won the approbation of such eminent scientists as Hooker, Lyell, Huxley, and Wallace, and other leaders of the scientific world of that day. An outline map of Nicaragua is included in the volume, and the original illustrations have been reproduced. The moderate price at which the volume is obtainable makes it possible for every student of natural history to include it in his library.

"An Intermediate Text-Book of Botany." By Ernest Evans. 8vo. 394 pp. (Longmans, London, 1911.) 6*s*.

This book has been written for students studying for the Intermediate Examination in Science of the London University. The usual types are well described and illustrated, but, making all due allowance, it does not cover the syllabus of the University. Particularly is this so with reference to Ecology, to which only eighteen pages is devoted. This important section should have been treated more fully. The enzymes, a most important group of substances, are dismissed in thirty-five lines.

An excellent feature are the numerous comparisons and diagrams showing the alternation of generations, &c.

We think the author has tried to cover too much ground.

We notice several printer's errors—viz. p. 57, "hypa" for "*hyphae*"; p. 190, fig. 143, Pulmonaria "*agustifolia*" should be "*angustifolia*"; p. 324, fig. 251, "Orobanche ramose" should be Orobanche ramosa; fig. 267, "Mimosa pudisi" should be *M. pudica*. The illustration on p. 19, fig. 10, does not help the text, and those under the head of Ecology are not clear.

Here and there are *vague* statements such as "Magnesium is of service in building up certain compounds," &c., but these will, no doubt, be remedied in future editions.

"Practical Botany." By F. Cavers, D.Sc. 8vo. 408 pp. (University Tutorial Press, London, 1911.) 4*s*. 6*d*.

In reading this book we were particularly interested in Chapter II.—"Cell Contents and Cell Walls." This is an excellent introduction to the "Bio-Chemistry of Plants." We have tried the chief reactions

and found the directions such as to give very satisfactory results. We thoroughly agree with Dr. Cavers as to the necessity for a preliminary course in organic chemistry for the intelligent study of this chapter. Chapters IV. to VII., on the physiology of plants, are very clear and exceedingly good. We are pleased to note Dr. Cavers' criticism of makeshift apparatus, and his advocacy of the use of special ready-made apparatus such as Ganong's.

In the life histories in Chapters VIII. to XII. we note the original treatment of *Pellia* and *Funaria* in particular.

We have tested the book, and can confidently recommend it as an excellent practical botany.

"Elementary Lessons on Plant Life." By D. G. Scott, M.Sc. 8vo. 219 pp. (Methuen, London, 1911.) 2*s.* 6*d.*

This book consists of chapters re "Observations on the Flowering Plant as a Living and Growing Organism." At the head of each chapter are suggestions for work that is to be done before the chapter is read. We were pleased to note that there are chapters on "Plants in Relation to their Surroundings" and "Plant Families," and that the latter precedes the former.

We should hesitate to introduce seaweeds, and particularly mosses and the field horsetail at so early a stage as Part II. of the book. The tabular arrangement of experiments is very helpful in the hands of a capable teacher, but should not be put into the hands of a scholar, as is recommended in the Preface. As a guide to a teacher who has very little knowledge of plant life it is of assistance.

We notice several printer's errors in the Preface: (1) Warming's "*Geology* of Plants" should be, of course, "*Ecology* of Plants"; (2) Willis's "Flowering Plants and Ferns" is mentioned *twice* in the list of authorities consulted.

"Second Stage Botany." By J. M. Lowson, M.A., B.Sc. 8vo. 544 pp. (University Tutorial Press, London, 1911.) 4*s.* 6*d.*

This book has been written to meet the requirements of the Board of Education Examination in Second Stage Botany; but we think the section on Ecology, consisting of only thirty-seven pages of matter, would require supplementing. The diagrams, which are quite a feature of the book, are very clear and able to be easily reproduced. The life histories of the lower cryptogams are graphically represented. We wish the chapter on "The Relationship between Vascular Cryptogam and Flowering Plant" had been more fully treated.

"A Text-book of Botany for Colleges and Universities." By Members of the Botanical Staff of the University of Chicago. (American Book Company, New York.)

Vol. I., Part I., includes Morphology, and Part II., Physiology; Vol. II. is devoted to Ecology. Morphology is represented by brief descriptions of types of all the groups of Cryptogams (pp. 1-170) and Gymnosperms (pp. 180-228). In Angiosperms we have details on the

stem, root, leaf, flower, &c., but only a brief description of Monocotyledons (pp. 276-279) and of *Orchichlamydeae*. It is stated that in the sub-group containing *Polygonum*, *Amaranthus*, *Chenopodium*, and *Caryophyllaceae*, &c. "insect pollination is established only among the pinks." The author does not here seem aware of species of *Polygonum* with brightly coloured or white calyx, nor of the dimorphism of Buckwheat. The other sub-group is *Sympetalae*. The fifth chapter treats of Organic Evolution, and deals with Environment, Use and Disuse, Natural Selection, Mutation, &c., which might, perhaps, with more propriety come under Ecology (p. 283-294).

Part II.—Physiology—contains a brief account of all the usual subjects under that head. With regard to transpiration, the author seems to regard it as synonymous with evaporation (p. 321). But as transpiration is influenced especially by the red and violet rays of light, and evaporation by heat, it would certainly seem desirable to designate the two processes by distinct terms. Apart from this omission, the whole of this section is a valuable epitome of the latest views on photosynthesis and other functions of leaves, &c.

Vol. II. is entirely devoted to Ecology, and is a serious attempt to discuss the forms and internal structures of plant-organs, roots, leaves, stems, &c., in conjunction with the external agencies which affect and often change them. Though illustrating the adventitious roots of maize, the author does not appear to be aware that the absence of a tap-root is characteristic of *all* Monocotyledons, and is one of the numerous features which prove their descent from aquatic Dicotyledons.

With regard to the Origin of Species, the author is inclined to avoid all appeal to teleology, preferring to regard variations as due to "mechanical causation," and so purposely avoids speaking of "adaptation." We think this is a useless self-restriction. One cannot avoid *seeing* adaptation everywhere in structures for definite uses; therefore, why not call them such? It commits one to no theory of *how* the adaptation arises. Sir A. H. Church's word "directivity" is an admirable term, and commits one to nothing when one says "Life directs forces so as to move matter and to make a useful or purposeful structure."

Taking the two volumes in their entirety, they are very interestingly written, and will convey to the student a large amount of matter which will guide him in the right direction by its ecological application of plant life.

"The Forest Trees of Britain." By Rev. C. A. Johns, B.A., F.L.S. Revised by Professor G. S. Boulger, F.L.S., F.G.S. Ed. 10. 8vo. 431 pp., with illustrations and sixteen coloured plates. (Society for Promoting Christian Knowledge, London, 1912.) 6*s*. net.

The fact that this book has passed into a tenth edition is sufficient proof of its popularity, and that, too, in spite of the numerous works on a similar subject that have appeared of late years. Having reviewed earlier editions of the work, we must in fairness say that

Professor Boulger has done much to bring the present volume up to date, and to attend to some of the omissions which appeared in its predecessors. Little can now be added to what is so well said about each tree—description, peculiarities, folk lore, and the dozen and one interesting notes from almost every writer on the subject from Parkinson's time down to the present day. Something more might well have been added about the Eastern Plane tree, such as the value of its timber for burning, and that it is a variety of this species that succeeds so well in smoky localities, and is now popularly known as the London Plane. Probably the most important use for Alder wood at present is in the manufacture of clog-soles, for which thousands of trees are sold annually.

We think the title of the book might have been extended, for neither the privet, ivy, Euonymus, guelder rose, nor buckthorn can by any stretch of imagination be included under "The Forest Trees of Britain." The book is nicely got up, well printed and illustrated, and will prove a valuable mine of information regarding tree and shrub growth in this country to those who are interested in the fascinating subject.

"The Romance of the Seasons." By F. Martin Duncan, F.R.M.S., F.R.P.S. 8vo. 262 pp. (Chapman & Hall, London, 1911.) 6*s*. net.

Mr. Duncan has given us a charming and artistic book which will appeal strongly to all lovers of Nature.

In the old-world myth with which it opens we read how, at the departure of Persephone to reign as the unwilling bride of Pluto in the Underworld, Demeter, the earth-mother, mourns the loss of her daughter in the guise of autumn and winter. "So in the wild wailing of the autumn and winter gales we hear the heart-broken, questioning cry of the mother, as she passes across the lonely country in the dark chill night," and how, at Persephone's return to earth in the spring, Demeter sends new life into the buds, so that the whole earth rejoices in welcome.

The book is full of beautiful photographs taken by the author, and there are countless quaint anecdotes of bird and insect life that call to mind Richard Jeffries at his best.

There is a chapter on the wholesale and ignorant destruction of insect-eating birds which should be read and noted by all fruit-growers and horticulturists. Another chapter, headed "Nature's maligned children," describes many remarkable superstitions and ideas concerning toads, owls, and snakes.

"Ye Flower-Lover's Booke." Compiled by G. Clarke Nuttall. 8vo. xvi. + 238 pp. (Cassell, London, 1911.) 2*s*. 6*d*. net.

This little anthology will be welcome to many. It is largely culled from authors of the last 150 years, but a few older ones are drawn upon here and there.

"Breeding and the Mendelian Discovery." By A. D. Darbishire. 8vo. xii. + 282 pp. (Cassell, London, 1911.) 7*s*. 6*d*. net.

This is a clear and accurate account of Mendel's work, and of some done on similar lines, mainly with plants, since Mendel's paper was discovered and published in our JOURNAL. The text is made more clear by several coloured plates and many black and white illustrations and diagrams, and clear directions for the raising of hybrid peas, &c., are given.

"Irises." By W. Rickatson Dykes, M.A. 8vo. xiii. + 109 pp. (Jack, London, 1912.) 1*s*. 6*d*. net.

Within the limits of a single genus there are few kinds of plants that give flowers over such a long period as the species of Iris, and fewer still if only the hardy species are admitted. The editor of the "Present Day Gardening" series has therefore wisely included a volume upon these beautiful plants, and his choice of an author could certainly not have been bettered.

No one has studied more thoroughly than Mr. Dykes the life and habits of the Irises, and he has given in this popular book of the wealth of his experience and erudition, so that we may look for a much extended cultivation of the less well-known species. Everyone may find plants to his taste, even those whose great desire is to overcome the dislike of plants to garden conditions, for scarcely anyone has succeeded in making the intractable Oncocyclus Irises respond kindly to the treatment meted out to them. We can confidently recommend this book as a well-written, well-printed and reliable guide to the would-be Iris grower, and feel sure it will enthuse many with the love of the Iris whose love has hitherto been but faint.

Several forms are illustrated by coloured plates, reproduced by means of colour-photography; but the colour-printing is less successful in this volume than in several of its predecessors. There is scarcely one of the plates faithful in colouring to the original.

"Earthworms and their Allies." By F. E. Beddard, M.A., F.R.S. 8vo. vii + 150 pp. (University Press, Cambridge, 1912.) 1*s*. net.

An outline of the structure and life history of the earthworms of the world, including their geographical distribution and distribution according to habitat.

"The Regent's Park and Primrose Hill." By A. D. Webster. 8vo. 112 pp. (Greening, London, 1911.) 5*s*. net.

Although much has been written about London and its open spaces and parks, this work covers ground that has never been touched, and Mr. Webster has added much interest to his book by placing before his readers many antiquities of Old Marylebone Park, Barrow Hill, and other places that should not be forgotten. The present Regent's Park was the old Marylebone Park, and, after the death of King

Charles, was sold by Parliament to John Spencer, on behalf of Colonel Harrison's regiment of Dragoons, on whom it was settled for their pay. The price paid for the park was £13,215 6*s*. 8*d*., including £130 for 124 head of deer, and £1774 8*s*. for the timber. There are many quaint and old illustrations, including one of an execution at Tybourne about 1630. Very few people are aware that the Royal Toxophilite Society has its headquarters in Regent's Park, with over six acres of grounds. It is interesting to know that it possesses probably the most unique collection of bows and arrows in existence, including a case of Chinese bows and arrows from the tombs, dated B.C. 2600. The Zoological Society acquired their grounds in Regent's Park in 1828, and nearly in the centre of the park are the gardens of the Royal Botanic Society, once famous for their beauty and their magnificent Horticultural Shows. Barrow Hill is now known as Primrose Hill, and Mr. Webster has collected a tremendous quantity of information on the ancient doings at this place; among other things it appears to have been a favourite neighbourhood for settling affairs of honour. Not content with the antiquities and history, the author deals with the fungi, bird and animal life, the entomology and the flora of the Park and Primrose Hill, all full of interest to the naturalist. The book is boldly printed, and contains many old illustrations and a good index. It is written in such a fascinating style that one wishes not to lay it aside till it is finished.

"Garden Design in Theory and Practice." By Madeline Agar. 8vo. 272 pp. (Sidgwick & Jackson, 1911.) 7*s*. 6*d*. net.

We commend the authoress for omitting everything in the way of cultivation, lists of things to plant on various soils, &c. The book is all the more useful through treating on garden design only, but when she says the art of design in the garden has deteriorated, we feel inclined to differ. Very few new gardens are made of such colossal and noble design as some of a century or more ago—such, for instance, as Chatsworth, Alton Towers, Belvoir, and many other notable gardens—but if the occasion arose for the design of such imposing places, we feel sure the design would be as artistic as any of the famous gardens in existence. As regards the instruction on how to make a garden we have nothing but praise, and although we have no national style of garden, we think this is one of the greatest charms of British gardens; all are so different, scarcely one being a repetition of the other, individual taste and environment both playing a very important part in the design. On page 35 an illustration is given of a French garden, with its strict formality of straight paths, and everything to match; a style that will appeal to very few now, although in some places it would be quite in keeping with the architecture of the mansion. There is a capital illustration on page 123 of a formal garden at West Hall, Byfleet, Surrey, enclosed by yew hedges, and adjoining the Hall itself. In such instances good taste is at once apparent, but to put such a garden in grass would be

ridiculous. As gardeners and their employers frequently lay out their own gardens, this book will be very helpful, and also the young man adopting landscape gardening as a profession will find much serviceable matter. Good printing and an excellent index help to make the book one that garden-makers should possess.

"Fungous Diseases of Plants." By B. M. Duggar. 8vo. xii + 508 pp. (Ginn, London, 1909.) 8*s*. 6*d*.

Though written especially for American growers, this book will be found most useful for England too, for unfortunately the diseases of plants in one district are apt to spread all too rapidly to others, and American plant diseases have made their unwelcome appearance here in many cases, while European parasitic fungi have not been slow to make their way to America. Further, the remedies and methods of prevention are necessarily very similar on both sides of the Atlantic.

The book is not only useful for the cultivator, but for the student of plant diseases as well. It is accurate, comprehensive, well printed, and well illustrated, and contains descriptions of methods of work, and references to some of the important literature of plant disease under each separate heading. We have used the book with profit, and can confidently recommend it to others.

"Plant Life and Evolution." By D. H. Campbell. 8vo. 360 pp. (Holt, New York, 1911.) $1·60 net.

This book contains ten chapters as follows: "Introduction," "Factors in Evolution," "Lower Plants," "Origin of Land Plants," "Seed Plants," "Angiosperms," "Environment and Adaptation," "Problems of Plant Distribution," "Human Factor in Plant Distribution," and "The Origin of Species."

In the Introduction the author observes that "We have no positive evidence . . . that 'vital' phenomena are not reducible to terms of physics and chemistry," and that "living matter is not subject to the same laws that govern inorganic bodies." To a large extent this is true: thus respiration *is* combustion, the waste products of carbonic acid and water being the same; but the obvious "purpose" everywhere to be seen in organic beings, could not possibly be the result of "blind forces" and "inert matter." Life is their *director* throughout.

Speaking of De Vries' mutations as the origin of species, such may be true provided the new characters produced are sufficient and distinct enough for systematic botanists to regard them as specific. From a study of De Vries' books, as a rule, they do not appear to be so, being simply the results of a sudden change from a "nearly pure sandy soil" to a "richly manured" one, as he tells us, and the difference lies mainly in foliage. It is the "change in the conditions of life," as Darwin calls it, which excites the variability of the plant, and it is only a question of degree whether the result of the plant's response is enough to make a species or not.

The author is doubtful as to the "Inheritance of acquired characters" (pp. 24, 25, 32): but this has been proved by ecologists, as Warming, Henslow, and others, to be the case.

The author regards natural selection as the "deciding factor"; but as far as the *origin* of species is concerned, there is no selection, but only "fortuitous destruction," as Darwin calls it. In a patch of seedlings, if they vary at all in growing up they all *vary alike*, and those which die do so by being crowded out. When plants are adult and struggle together, it is the *better adapted under the circumstances* which live.

He regards the green freshwater Algae as the ancestors of the land plants. If so, how is it they do not set to work and make some more? They may be degradations and *not* primitive: while the true ancestors probably died out myriads of years ago.

Nothing is said of the origin of Monocotyledons from Dicotyledonous aquatic plants, as suggested by Henslow. The former show an abundance of degradations from the influence of water. Dealing with pollination, the author does not realize the superior advantages of self-fertilization; for the only "ends" of plant-life are a healthy existence and abundance of seed.

With regard to antiquity, he suggests that Angiosperms "probably appeared rather suddenly." He means they have only been *discovered* in the lower Cretaceous beds; but the reason is that the land surfaces and estuaries, etc., are exceedingly rare in the secondary strata; they are mostly marine.

Apart from the above criticism, the book is mainly composed of short accounts of the principal groups of plants, from the lower Cryptograms to the Angiosperms; but while the author thus deals fairly with plant-life, the reader will not gather much about evolutionary processes, and how they brought about the existing types of vegetable life.

"The Natural History and Antiquities of Selborne, in the County of Southampton." By Gilbert White. With Illustrations in colour by G. E. Collins, R.B.A. la. 8vo. 476 pp. (Macmillan, London, 1911.) 10*s*. 6*d*. net.

This is a handsome edition, 10 inches by 7 inches, bound in green cloth. There are twenty-four illustrations in colours of various scenes in the neighbourhood of a very picturesque character.

"Saturday in My Garden." By F. Hadfield Farthing. 8vo. 484 pp. (Grant Richards, London, 1911.) 3*s*. 6*d*. net.

This book is a reproduction of articles and diagrams first published in the *Daily Express*, with the addition of many new chapters, photographs, &c., which make the book more interesting than it perhaps might have been without them. It is specially written for amateurs, and the author has succeeded admirably in doing what he intended.

Another advantage is the moderate price of the book as compared with many others of the same size, most of them containing much less practical information. All the trees, shrubs, hardy and tender plants, fruits, flowers, and vegetables that the amateur may be ambitious to cultivate are dealt with fully, and a table of daily operations for the whole year is given. The book is beautifully illustrated, well printed, and possesses a good index.

"Encyclopædia of Gardening." By W. P. Wright. 8vo. 323 pp. (Dent, London, 1911.) 1*s*.

It is marvellous how such a book, entailing the vast amount of work it did, could be published at a shilling. It embraces all the flowers, fruits, vegetables, ferns, palms, trees, and shrubs in general cultivation, with a guide to their culture, and with the names of the best species and varieties. The book is of a handy pocket size, nicely printed, and in strict alphabetical order.

"The Pocket Gardener." By H. H. Thomas. 16mo. 298 pp. (Cassell, London, 1911.) 1*s*. 6*d*.

This is really an encyclopædia, with all plants arranged in alphabetical order, with brief cultural notes, names of the most popular varieties, and common names. A very handy little book.

"Gardens Shown to the Children." By Janet Harvey Kelman and Olive Allen. Described by J. A. Henderson. 8vo. 100 pp. (Jack, London, 1911.) 2*s*. 6*d*. net.

As children are now taking such a healthy interest in gardens and gardening, from the poorest class upwards, this little book will be a welcome one. It is written in such a clear style that even the dullest cannot fail to grasp the information given. The illustrations or pictures are in colour and admirably done, the printing is excellent, and a capital index completes the work.

"The Garden of a Commuter's Wife." By The Gardener. 8vo. 354 pp. (Macmillan, New York and London, 1911.) 6*s*. net.

An entertaining book, written in a racy style, of life in America, including servant troubles, as well as matters on outdoor pursuits, beautifully printed, but short of a good index.

"Farm and Garden Rule-Book." By L. H. Bailey. 8vo. 587 pp. (Macmillan, New York and London, 1911.) 8*s*. 6*d*. net.

All Professor Bailey's works are full of sound practical knowledge, and this is one of his best. Although written for American readers, it contains a vast amount of information on farm and garden operations that is applicable to this country. The chapter on manures, and the formulas for various crops and the estimated yield of produce from the acre is most reliable, and will be of great assistance to farmers and gardeners who cultivate their land well. One point the author is

rather strong on—viz., the judicious use of manure. He says, "The farmer should experiment with different fertilizers, and not depend on a chemical examination of the soil, unless he has reason to think that he has a very special problem. The widespread notion that chemical analyses of soil and of plant will tell what fertilizers to add and what crops to grow is erroneous." The author then goes on to describe how such tests should be made. The cultivation and management of soils, drainage, pests, and other plagues are fully dealt with, and the remedies advised are all thoroughly reliable. Fortunately, many of these nuisances are absent in this country, and readers of this book will realize how much more the grower in America has to contend with as compared with growers in this country. Altogether it is a capital work, well written and boldly printed.

"Scottish Gardens, being a Representative Selection of different Types, Old and New." By Sir Herbert Maxwell. 8vo. 206 pp. (Arnold, London, 1911.) 7*s.* 6*d.* net.

A delightful book, beautifully printed, admirably illustrated with thirty-two coloured plates, and full of most interesting lore of old Scotch seats, and showing many types of gardening, all beautiful, and all the more fascinating through the author's quaint humour running more or less through the whole book. It would be difficult to say which was the most attractive of all the lovely gardens so charmingly painted by Miss G. W. Wilson in this book, as they are all so different from each other, and what might gain the most favour from one might be received quite differently by another, and this is as it should be, for it would never do for all of us to have the same tastes and ideas. No doubt the book will appeal more to northern readers than to southerners, especially as there is so much history of families and ancient doings mingled with most valuable information of what trees, plants, and shrubs succeed best at the various places described. Not the least useful are the excellent appendices at the end of the book. Appendix A gives the species of Rhododendron suitable to the climate of the West of Scotland, with the colour and height to which they grow; and Appendix B gives other shrubs which have proved hardy in Scotland, with their colour of flower and height. We can confidently recommend the work to all who possess a large garden in any part of the kingdom.

"Vine-Growing in England." By H. M. Tod. 8vo. 113 pp. (Chatto & Windus, 1911.) 1*s.*

A neat and interesting little book, showing that outdoor grapes may be successfully cultivated in the most favoured parts of the kingdom, but with wines so cheap from abroad, and the distance birds will come to enjoy the feast of ripening grapes, it is doubtful if this crop will be taken up by many on a large scale. The book is well printed, but would be improved by an index.

"Forestry for Woodmen." By C. O. Hanson. 8vo. 222 pp. (Clarendon Press, Oxford, 1911.) 5*s*. net.

The title of this useful book is not very appropriate, as much of the information is far beyond the knowledge of the ordinary woodman, who knows little and cares less about sectional areas, volume of wood, carbon dioxide, or the intricacies of decimals and percentages. To the intelligent forester or woods manager the book is more likely to appeal, though that it was brought out as stated by the author to supply a cheap book on scientific forestry for those who could not afford the more expensive books is hardly in keeping with facts, as one book at least, which is now passing into its fifth edition, was originally published at the low price of 3*s*. 6*d*. Good advice—practical and to the point—is given in the chapter dealing with tending of woods, and we are glad that the old system of extended pruning operations is abandoned, and the advice to pay fellers of timber by the day instead of by contract is sound, and should be insisted upon, particularly in dense or ornamental woods.

The author is evidently in favour of mixing larch with other trees, but we might point out that the majority of the pure larch woods in Scotland and England are those that pay best, and, curiously enough, the frontispiece illustration and that at page 169 show finely-developed larches in pure woods.

In the notes on broad-leaved trees, the white ash and some other useless species might well have been omitted; while the long list of birds, injurious and otherwise, at page 111 will interest the woodman but little, for he has but small say either in their destruction or preservation.

"Methods of treatment" is an excellent chapter, and we only wish that rotation—both of planting and felling—was more generally adopted in dealing with British woods and plantations.

"Cucumber Culture." By W. Dyke. 7 in. × 4 in. 90 pp. (Lockwood Press, London.) 1*s*. net.

A little handbook devoted entirely to the cultivation of the cucumber, and especially to the experiences of the author in the growth of cucumbers for market. All phases of the subject are dealt with, and even the experienced grower will find something suggestive in the booklet, though of course the actual method of procedure will necessarily vary under different conditions. The author seems to have found naphthalene an excellent remedy against various soil pests. The form of the book is not very handy, and a little more care might have been advantageously expended upon the proof-reading. There are many errors which might easily have been corrected—*e.g.* Ritzman Bos for Ritzema Bos, *Glocosporium* for *Gloeosporium*, *Neocosmopora* for *Neocosmospora*, *Mycosphaerelle citrulina* for *Mycosphaerella citrulina*, and so on.

"Links with the Past in the Plant World." By A. C. Seward. 8vo. ix + 142 pp. (University Press, Cambridge, 1912.) 1*s*. net.

A most interesting, popular account of the origin of some of our great groups of plants as indicated by the fossil vegetation of the past. It is well written, well printed, and well illustrated.

"Forest Physiography." By I. Bowman, Ph.D. 8vo. xxii + 759 pp. (Chapman & Hall, London, 1911.) 21*s*. net.

This work is one of the utmost importance to those engaged in forestry anywhere in the world, for though it deals with the interaction between soils and earth configuration and forests in America, the principles laid down will hold anywhere.

Maps and diagrams and half-tone illustrations help to elucidate the text, and the subject will be found to be most completely treated.

"The Profitable Culture of Vegetables, for Market Gardeners, Small Holders, and others." By Thos. Smith, F.R.H.S. 8vo. pp. 452. (Longmans, London, 1911.) 6*s*. net.

We have no hesitation in saying that this is the finest book dealing with this difficult matter that we have ever come across, combining as it does all the best of what has been written on the subject and much that has never before been put into words, but which is the accumulated result of generations of practice in this difficult art both in this country and on the Continent.

We wish to lay emphasis on the latter feature of this book, since it is one which distinguishes it from very many of the books which are published with gardening subjects, and which enables it to fulfil in some considerable measure the aim which the author had in view, as he tells us in the preface. "The purpose of this book is to supply such information as the grower of vegetables is likely to require in connexion with the productive part of his business, from the preparation of the soil to the marketing of the produce. . . . I have endeavoured to convey the information clearly, in full detail, but free from superfluities, and it is my earnest hope that it will be found of real help . . . I have made the venture because, in spite of their number and variety and the great value of some of them, I have hitherto failed to find one which satisfies me as being just the book those engaged in the culture of vegetables are in need of. The result may easily prove that I also have failed to produce what is required, but I shall at least know that I have tried to the best of my ability to do work which needed doing."

The subject is most thoroughly dealt with, as a glance through the list of chapters abundantly shows, "Soil and its Treatment," "Manures and Fertilizers," "Selection of a Small Holding," "Rotation of Cultivation, Manuring, and Cropping" all being subjects which precede those dealing directly with the details of the cultivation of each particular vegetable.

We are pleased to see that on the much-vexed subject of "French Gardening" the author takes what appears to us to be a sane, sensible view, neither on the one hand by means of exaggerated statements unduly belauding this particular system of culture, nor on the other, as some writers are prone to do, condemning everything in relation to the attempt to establish it on English soil.

"French gardening, as a specialized business, is therefore not to be recommended except under really favourable conditions; but the system is rich in hints and suggestions of great value, which can be turned to profitable account by the market gardener."

Almost every operation connected with the growing of vegetables, from the sowing of the seed to the marketing of the produce, is illustrated by photographs and diagrams, which, combined with the clear wording of the directions in the text, make up a mass of cultural advice which it would be hard for even the dullest reader to misunderstand. The chapters dealing with general advice as to culture and management, 139 pages, are followed by special details as to the culture of each particular crop, 141-365; a diary of work to be done month by month, 367-381 (we think this is a particularly useful feature, especially to the man who is in doubt when to sow, &c.); grading, packing, and marketing, 382-399; insect pests and fungoid diseases which attack vegetables, chapters contributed by the son of the author, 400-436; miscellaneous information, 437-443, a most valuable chapter to all engaged in growing and marketing vegetables, giving all sorts of tables of weights, measures, and terms in use in the markets, fertilizing values of various manures, number of plants to the acre, quantity of seed required for an acre, and other things too numerous to mention here—in fact, a mass of information which is so difficult to find in any book, but which is often so very handy to the busy man engaged in this occupation.

We are particularly pleased to note that in the chapters dealing with each particular vegetable the author gives a list of the varieties to grow for the different seasons; for forcing; for early, maincrop, and "lates," and in many cases for various sorts of soils. There is included a very comprehensive index and a host of illustrations and diagrams, so that it should not be difficult for anyone requiring information on any point to quickly find out what he seeks plainly put before him. We can only repeat that we consider this a most valuable book, and state that we intend to have it always handy to refer to in any difficulty we may come across in the business in which we have been engaged for many years, "the culture of vegetables for market."

"The Plums of New York." By H. V. Hedrick, assisted by R. Wellington, O. M. Taylor, W. H. Alderman, M. J. Dorsey. 4to. 616 pp. Report of New York Agricultural Experiment Station, 1910. (New York Agr. Exp. St. Albany, 1911.)

The publication of this modestly named "report" is somewhat of an event in the annals of pomological literature. If published under

other than Government auspices it would be termed a monograph rather than a report, as the lengthy and careful descriptions of varieties and species are quite unique for completeness and accuracy. Whilst the title limits naturally the varieties dealt with, it must not be imagined that only plums suited to that State are described. On the contrary, nearly every European sort of importance will be found, and many reproduced, full size, in colour. Naturally the species receive first attention, and photographs of flowering sprays and bark characters are an extremely useful aid to a clear recognition of their distinctive characters. It is impossible within the limits of this review to discuss the decisions arrived at, but they are well worthy of detailed study, dealing as they do with many questions of great difficulty, such, for instance, as the birthplace and wanderings of *Prunus domestica*. Following this are chapters on culture and the various stocks preferred by American nurserymen; and we notice that the peach stock is preferred for most varieties of the *Domestica* group and the *Triflora* varieties, and the *Myrobalan* for others. English experience has shown the latter stock desirable for most plums in this climate. The varieties are next described, and the distinctive characters are selected with great care, and are dealt with in greater detail than in any other work we can recall. Tree, leaf, flower, and seed are all fully and carefully described. This is as it should be. The disregard by so many European pomologists of all characters but the fruit has rendered their work in many cases of less value than it should have. The "systematic" botanist would not think of naming a plant from one only of these parts, and in the case of varieties of fruits so similar as are many of the plums it should be still more necessary to have every possible detail. Many fruits are admittedly sufficiently distinct to permit of their recognition at once, but to imagine therefore that all fruits can be similarly recognized shows a lack of exactness which is and has been too often associated with pomologists. We welcome therefore the minute and exact descriptions that Professor Hedrick has given, and we are sure they will be still more valuable to students a hundred years hence, when many of the varieties are lost or forgotten. There is, however, one character which is constant, in this country at least, which has not been made use of—that of the colour tips of the growing shoots. The range of colour from pale green to a strong red on the young leaves is a very distinct and useful recognition mark. We note that the fact that many shoots are pubescent only when young is recognized. The port of the leaves, upright—weeping—upward folded, &c., is described; these are excellent characters which have been much neglected.

The references to literature are very full, and the only point of criticism we would make in this respect is that they are not sufficiently sifted. Quotation from writers of little authority merely serves to complicate matters. As an example, the case of the Greengage may be quoted. Here Batty Langley and Phillips are referred to, both writers of little importance on such matters, the latter a mere book-

maker. In the matter of synonyms, Dr. Hogg's authority for the identity of the Verdoch of Parkinson with the Greengage is quoted. This, however, is, we think, a mistake, as Parkinson's description of Verdoch as "a great fine green shining Plum fit to preserve," and his later reference to the Olive Plum as "the best of all sortes of greene Plums" do not render it likely that the first is identical with the Queen of Plums—the Greengage. There seems to be little doubt, as Hogg says, this fruit was grown in England long before its reintroduction by a member of the Gage family, and to which it owes its name, but his opinion of its Grecian origin is not so certain. Koch found in the Caucasus certain wild Plums of an extremely close resemblance to the Greengage, and the fact that it also comes almost true from seed tends towards ranking it as a true species.

A striking and unique feature of this work are the descriptions of the hybrids of the American and Japanese varieties; we know of no other fruit where so exact and careful a record has been kept of the blending of the alien races of fruits with the native species, and for students of biology there is here valuable material and concrete records where in analogous cases probabilities and guesses are the only resource. Of the *format* of the book there is nothing but praise. Its 580 quarto pages and coloured plates form a bulky work, but when quality is added to size the pomologist at least will not complain. The plates are examples of the so-called three-colour work and of a high grade. Fruits, leaves, and branches, and also stones are depicted.

Typographical errors are but few, and it only remains to congratulate the authors very heartily on the completion of an undertaking, the magnitude of which is only to be realized by those who have attempted a similar task. We hear the authors have now upon the stocks companion volumes dealing with Pears and Cherries. Verily, a great country is America, and the men that dwell therein!

REPORT ON EXAMINATION OF EMPLOYEES IN PUBLIC PARKS.

JANUARY 8, 1912.

THE Royal Horticultural Society's Seventh Examination of Employees in Public Parks was held on January 8, 1912.

As previously, the examination was partly viva voce and partly written, occupying three hours and twenty minutes. It was held at the Society's Hall in Vincent Square, Westminster.

Forty-nine candidates entered, and of these 17 secured places in the first class, 7 in the second, and 16 in the third, leaving 8 who failed to satisfy the minimum requirements of the examiners and one who was absent.

The examiners report that the average quality of the written answers equals that of former years, no marked advancement being noticeable in the examination taken collectively. Many cases of individual improvement, however, were noticed—candidates of past years being found to have considerably extended their knowledge. The identification of specimens in the viva voce section was better, the names being generally given unhesitatingly and correctly.

Some good answers were given to Question 7 on leaf physiology; otherwise there was evident lack of careful reading on the subject of the structure and operations of the leaf.

The selection and action of artificial manures were well known.

Scope was given in Question 9 to select and arrange plants suitable for ornamental water, but few candidates were familiar with the many beautiful forms of reeds and water plants that give character to the water margin; lists of subjects were given, but they were too formal, and all kinds of unsuitable stuff were included.

Public park gardeners are again recommended to take the Society's General Examination after having passed that for public parks employees, for, as pointed out in last year's report, it forms an object for more advanced study.

At the request of the London County Council, the former division of the candidates into two groups, A and B, is discontinued.

C. R. FIELDER,
OWEN THOMAS,
JOHN W. ODELL,
W. CRUMP,
EDWARD WHITE,
W. WILKS,
} *Examiners.*

Class I.

1. Fred J. Nash, 44 Meynell Road, Leicester.
2. {Thos. Scott, 40 Grayling Road, Stoke Newington.
   Wm. Chas. White, Brocket Hall, Hatfield.
4. Walter Davies, 249 Sandycombe Road, Richmond.
5. John Tyrrell, Roath Park, Cardiff.
6. William Good, 34 Glenferrie Road, St. Albans.
7. George Nile, 22 Framfield Road, Highbury.
8. James Hurley, 141 Trundley's Road, Deptford.
9. William H. Jeffery, 83 Taunton Road, Lee Green.
10. James Jarrett, Queen's Park, Harborne, Birmingham.
11. Frederick Stevens, 32 Siddons Road, Forest Hill.
12. William E. Kemsley, Belle Road, Sittingbourne.
13. Henry Herne, 171 Railton Road, Herne Hill.
14. Edward Martin, 65 Harberton Road, Highgate.
15. H. Johnson, 15 Mallet Road, Hither Green, Lewisham.
16. G. Bowles, 10 Devonshire Road, Mottingham, Eltham.
17. Herbert G. Foster, 7 Crewys Road, Child's Hill, Hendon.

Class II.

1. Albert G. King, 77 Gloucester Road, Kew Gardens.
2. W. H. Mouser, 4 Lauderdale Houses, Waterlow Park, Highgate.
3. George Brooks, 47 Selborne Road, Wood Green.
4. Harry Adams, 8 Charles Street, Upper Sydenham.
5. J. H. Copeland, 237 Underhill Road, East Dulwich.
6. W. Wickenden, 174 Hamilton Road, West Norwood.
7. W. A. Cooper, 2 Andrew Villas, Underhill Road, E. Dulwich.

Class III.

1. W. Power, 70 Bonner Road, Victoria Park, N.E.
2. Geo. Miller, 111 Goodrich Road, E. Dulwich.
3. T. S. Newman, 42 Leahurst Road, Lewisham.
4. G. J. Rule, 4 Darley Road, Wandsworth Common.
5. John F. Lee, 81 Byne Road, Sydenham.
6. {Richard Streatfield, 32 Coombe Road, Upper Sydenham.
   John W. Cordock, Ivy Cottage, Rolfe Road, Charlton, Kent.
   J. E. H. Ward, 65 Paulet Road, Camberwell.
9. P. Perry, Brookfield Cottage, Millfield Lane, Highgate.
10. E. J. Stewart, 27 North Road, Highgate, N.
11. {Percy Church, 1 Canning Road, Highbury, N.
    John Chapman, 41 Finland Road, Brockley.
13. H. Crane, 29 Kenchester Street, S. Lambeth.
14. {C. T. Free, 42 Dixon Street, Salmon's Lane, Limehouse.
    George W. Allchin, 106 Castle Street, Battersea.
16. Harry Cotton, Claymore Cottage, Roydon, Essex.

NOTES ON RECENT RESEARCH

AND

SHORT ABSTRACTS FROM CURRENT PERIODICAL LITERATURE, BRITISH AND FOREIGN,

AFFECTING

HORTICULTURE & HORTICULTURAL SCIENCE.

JUDGING by the number of appreciative letters received, the endeavour commenced in volume xxvi. to enlarge the usefulness of the Society's Journal, by giving an abstract of current Horticultural periodical literature, has met with success. It has certainly entailed vastly more labour than was anticipated, and should therefore make the Fellows' thanks to those who have helped in the work all the more hearty.

There are still, we feel, some departments of Horticulture and Horticultural Science very imperfectly represented in these abstracts, and the Editor would be grateful if any who have time at command, and who are willing to help in any special direction in this work, would communicate with him. He desires to express his most grateful thanks to all who co-operate in the work, and he ventures to express the hope that they will all strictly adhere to the general order and scheme of working, as the observance of an identical *order* can alone enable the Editor to continue to cope with the work. The order agreed on is as follows :—

1. To place first the name of the plant, disease, pest, &c., being noticed ; and in this, the prominent governing or index word should always have precedence.

2. To place next the name, when given, of the author of the original article.

3. Then, the abbreviated form of the name of the journal, &c., in which the original article appears, taking care to use the abbreviation which will be found on pp. 100, 101.

4. After this, a reference to the number, date, and page of the journal in question.

5. If an illustration be given, to note the fact next, as "fig.," "tab.," or "plate."

6. After these preliminary necessities for making reference to the original possible for the reader, the abstract or digest should follow, ending up with the initials of the contributor affixed at the close of each Abstract or Note.

NAMES OF THOSE WHO HAVE KINDLY CONSENTED TO HELP IN THIS WORK.

Baker, F. J., A.R.C.S., F.R.H.S.
Ballard, E., F.R.H.S.
Beer, R., B.Sc., F.L.S., F.R.H.S.
Boulger, Professor G. S., F.L.S., F.R.H.S.
Bowles, E. A., M.A., F.L.S., F.E.S., F.R.H.S.
Bunyard, E. A., F.R.H.S.
Cayley, D. M.
Chittenden, F. J., F.L.S., F.R.H.S.
Cooke, M. C., M.A., LL.D., A.L.S., F.R.H.S., V.M.H.
Cotton, A. D., F.L.S.
Darlington, H. R., F.R.H.S.
Druery, C. T., V.M.H., F.L.S., F.R.H.S.
Dykes, W. R., M.A., F.R.H.S.
Farmer, Professor J. B., M.A., D.Sc., F.R.H.S.
Groom, Professor Percy, M.A., D.Sc., F.L.S., F.R.H.S.
Hartog, Professor Marcus, D.Sc., M.A., F.L.S., F.R.H.S.
Henslow, Rev. Professor Geo., M.A., F.L.S., F.R.H.S., V.M.H.
Hodgson, M. L., F.R.H.S.
Hooper, Cecil H., M.R.A.C., F.R.H.S.
Horne, A. S., B.Sc., F.G.S., F.R.H.S.
Houston, D., F.L.S., F.R.H.S.
Jeffery, Violet G., F.R.H.S.
Kent, A. H., A.L.S., F.R.H.S.
Kerridge, Rev. A. A., M.A., F.R.H.S.
Long, C. H., F.R.H.S.
Massee, Geo., F.L.S., F.R.H.S., V.M.H.
Newstead, R., A.L.S., F.E.S., F.R.H.S.
Pethybridge, G. H., B.Sc., Ph.D., F.R.H.S.
Petts, Alger, F.R.H.S.
Rendle, A. B., M.A., D.Sc., F.L.S., F.R.S., F.R.H.S.
Reuthe, G., F.R.H.S.
Scott Elliot, G. F., M.A., B.Sc., F.L.S., F.R.H.S., F.R.G.S.
Smith, William G., B.Sc., Ph.D., F.R.H.S.
Swire, W., F.R.H.S.
Veitch, Harry J., F.L.S., F.Z.S., F.R.H.S.
Voss, W. A., F.C.S , F.R.H.S.
Webster, A. D., F.R.H.S.
Welby, F. A., F.R.H.S.
Whittles, W., F.R.H.S.
Williams, S. E., F.R.H.S.
Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope	Agr. Jour. Cape G.H.
Annales Agronomiques	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort.	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg	Ann. Jard. Bot. Buit.
Annals of Botany	Ann. Bot.
Beiheft zum Botanischen Centralblatt	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Broteriana	Bol. Soc. Brot.
Botanical Gazette	Bot. Gaz.
Botanical Magazine	Bot. Mag.
Bulletin de la Société Botanique de France	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad	Bull. Bot. Dep. Trin.
Bulletino della R. Società Toscana d' Orticultura	Bull. R. Soc. Tosc. Ort.
Canadian Reports, Guelph and Ontario Stations	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie	Cent. f. Bact.
Chronique Orchidéenne	Chron. Orch.
Comptes Rendus	Comp. Rend.
Contributions from U.S.A. Herbarium	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées	Dict. Icon. Orch.
Die Gartenwelt	Die Gart.
Engler's Botanische Jahrbücher	Eng. Bot. Jah.
Gardeners' Chronicle	Gard. Chron.
Gardeners' Magazine	Gard. Mag.
Gartenflora	Gartenflora.
Journal de la Société Nationale d'Horticulture de France	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agricult. Victoria	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Science	Jour. Agr. Sci.
Journal of Botany	Jour. Bot.
Journal of Chemical Society	Jour. Chem. Soc.
Journal of Economic Biology	Jour. Econ. Biol.
Journal of Economic Entomology	Jour. Econ. Entom.
Journal of Genetics	Jour. Gen.
Journal of Horticulture	Jour. Hort.
Journal of the Board of Agriculture	Jour. Bd. Agr.
Journal of the Linnean Society	Jour. Linn. Soc.
Journal of the Royal Agricultural Society	Jour. R.A.S.
Journal S.E. Agricultural College, Wye	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte	Kais. Ges.
La Pomologie Française	Pom. Franç.
Le Jardin	Le Jard.
Lebensgeschichte der Blutenpflanzen Mitteleuropas	Lebens. d. Blutenpfl.
Mendel Journal	Mendel Jour.
Naturwiss. Zeitschrift Land und Forst	Nat. Zeit. Land-Forst.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Oesterreichische Garten-Zeitung	Oester. Gart. Zeit.

Journals, &c.	Abbreviated title.
Orchid Review	Orch. Rev.
Orchis	Orchis.
Phytopathology	Phytopathology.
Proceedings of the American Pomological Society	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry.
Queensland Agricultural Journal	Qu. Agr. Journ.
Reports of the Missouri Botanical Garden	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev. Hort.
The Garden	Garden.
Transactions Bot. Soc. Edinburgh	Trans. Bot. Soc. Edin.
Transactions of the British Mycological Soc.	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc.	Trans. Mass. Hort. Soc.
Transactions Royal Scot. Arboricultural Soc.	Trans. Roy. Scott. Arbor. Soc.
U.S.A. Department of Agriculture, Bulletins	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.

† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Abelia rupestris. By A. Heydt (*Gartenflora*, vol. lx. pt. xx. p. 447).—*Abelia rupestris* likes a half-shady position, in a well-manured soil. To induce a bushy habit, cut back the growth to one-half every spring. A slight protection in winter is desirable.—*S. E. W.*

Absorption of Food Substances and Poisons through Leaves. By Alfred J. Ewart (*Jour. Agr. Vict.* p. 619; Sept. 1911).—If a drop of a very dilute solution of potassium nitrate be placed upon a beech leaf and covered with a small bell-jar so as to check evaporation, when the drop finally disappears no crystals are left behind on the surface of the leaf; whereas, if the drop is allowed to evaporate rapidly, a little crystalline efflorescence is left behind, owing to the fact that the salt had not time to be absorbed before the water had evaporated.

Again, if the leaves of a plant happen to have become pale, as sometimes occurs owing to a deficiency of iron in the soil or to a difficulty in absorbing it, then merely painting the pale surface of the leaf with a dilute solution of chloride of iron will restore the green colour temporarily or permanently to the leaves so treated.

An instance of the absorption of a poison is that of copper sulphate solution, which adheres long enough to the charlock leaves to be absorbed by them and to cause their death, whereas the solution runs off the grass leaves without affecting them to any appreciable extent.

Superphosphate applied to the leaves of mustard and soy beans in the form of powder was found to destroy them.

Mustard and soy beans treated with nitrogenous food (nitrates, ammonium salts, asparagin), also with phosphates (super-phosphate, basic slag), could not absorb through the leaves sufficient to make good a deficiency in the soil, however carefully and thoroughly these substances were applied to the leaves.

On the other hand, potassium salts were readily absorbed through the leaves of mustard plants in the form of potassium sulphate, and preferably as potassium chloride in the case of soy beans.

Thus in Professor Hiltner's pot experiments: Without potassium the yield was 15 grammes; with chloride of potassium applied to the soil, 38 grammes; with potassium sulphate applied to the soil, 45.5 grammes; and with it sprayed on the foliage, 43.5 grammes.

Professor Hiltner (Professor of Agriculture at the University of Munich) sprayed 'Magnum Bonum' potatos that were badly attacked by leaf-curl disease (*Macrosporium Solani*) with various solutions with the following results:—

Plot	Weight of tubers in kilogrammes	Percentage of starch
Unsprayed	115·7	15·7
Sprayed with potassium nitrate solution	135·3	14·8
,, ,, kainit solution	153	15·2
,, ,, magnesium sulphate solution	124	15·2
,, ,, sulphate of iron solution	91	15·0
,, ,, humus solution	141	15·4
,, ,, Bordeaux mixture	144	14·5

The above solutions were applied in 2 per cent. strength with the exception of the sulphate of iron (1 per cent.), and the milk of lime (4 per cent.). It can be seen that five of these spraying materials increased to a greater or less extent the yield of the potatos and two produced a decrease, but that all of them caused some decrease in the percentage of starch as compared with the unsprayed plot.

C. H. H.

Acineta Moorei (*Bot. Mag.* t. 8392).—South America. Family, Orchidaceae; tribe, Vandeae. Herb, epiphyte. Leaves lanceolate-oblong, 12-16 inches long. Flowers, showy, subglobose, straw-coloured, closely covered with brown spots.—*G. H.*

Aciphylla latifolia (*Bot. Mag.* t. 8407).—Auckland and Campbell Islands. Family, Umbelliferae; tribe, Seselineae. Herb, glabrous. Stem, 3-7 feet high. Leaves, thick, leathery, radical, long stalked, 1-2 feet long, twice pinnatisect. Umbels, compound, 2½-4 inches across. Flowers, purple. Carpels 3-5 winged.—*G. H.*

Afforestation in Scotland. By Lord Lovat and Captain Stirling, of Kier.—This is one of the most up-to-date and valuable papers on the vexed question of afforestation that has come under our notice. Nothing of importance seems to have been omitted, and each subject has been carefully prepared by those who have had a practical knowledge of the formation and general management of woods and plantations.—*A. D. W.*

Agricultural Education, American. A. C. True and D. J. Crosby (*U.S.A. Dep. Agr., Office of Expt. Stn., Circ.* 106, p. 28; Feb. 1911; 8 plates).—The circular gives an account of the efforts made to supply technical agricultural education in America. Courses, of varying lengths, are planned to meet all requirements. One may take a complete course, ending in a degree; or a short evening or winter course, enabling one to understand more clearly the reasons for the daily farm operations.

Special courses are arranged for teachers, extending over twelve months or two years.

For those distant from the teaching centres extension lectures and correspondence courses are arranged.

The extension lecturers are specially trained men, who can put the facts of the case tactfully and succinctly before their hearers.

The circular also relates the part played by the Experiment Stations and Demonstration Farms in dispelling ignorance and introducing improved methods. The prejudice against so-called book-learning and theory is fast disappearing. The circular says that over 24,000,000 bulletins are distributed annually.

Page 28 gives a list of the agricultural colleges and elementary schools set aside for negros and Indians.—*W. W.*

Agricultural Education at Purdue Experiment Station (*Purdue University*, *Circ.* 24, p. 48; 41 plates, 1 fig., 1 map).—This is a brief outline of the work of the above station since its organization in 1887. It is drawn up on the lines of an English University calendar, but its illustrations and clearness make it much more interesting than these generally are. An account of the work in each department is given, together with a list of the staff. The work is chiefly extension work. The State Chemists' Department is one of the most interesting. The legislature of Indiana passed laws to ensure the farmer good, correctly stated fertilizers and foodstuffs, and to the manufacturer freedom from dishonest competition. The law, however, does not seem to be general throughout the U.S.A. For full results of the inspection of fertilizers and feeding-stuffs readers are referred to Bulletins 148 and 141.—*W. W.*

Agriculture in the Central Part of the Semi-arid Portion of the Great Plains. By J. A. Warren (*U.S.A. Dep. Agr.*, *Bur. Pl. Ind.*, *Bull.* 215, July 1911; 4 figs.).—The most serious feature of the climate of this vast region is the variability of the rainfall, while its general insufficiency for the needs of crops is accentuated by the prevalence of strong winds and intense sunlight, experiments having shown that with a wind at twenty miles an hour evaporation is 5·9 times as rapid as during a calm (p. 16). In South-Eastern Colorado the evaporation from an open water surface is 50 inches during the growing season, and loss at this rate where the average annual rainfall is between 10 inches and 20 inches a year often means very critical periods for crops, even though they are sometimes of only a few hours' duration. As an instance of this, investigation made on one day, which was by no means exceptional in its character, showed that a single corn-plant standing in a field of corn lost 9½ lb. of water in 8½ hours (p. 15).

The bulletin deals with the general aspect of farming in these States, both present and future, and the general methods adopted. On account of the dryness of the climate there is usually a large store of mineral plant food in the soil but no large quantity of organic matter, and it is thought that the addition of humus would so change the water-holding properties of the soil as to enable a crop to be produced with less rainfall (p. 19). See Abstract on "Dry-Farming in Relation of Rainfall and Evaporation" on p. 457 of the JOURNAL for December 1911 (vol. xxxvii. p. 457).

The country is now being resettled after the disastrous failures in

the 'nineties, but the writer warns intending settlers that the good results which have been obtained of late years by experiment stations and farmers alike, though much boomed in the Press, have been largely owing to the more than usual number of favourable seasons which have occurred during the last few years (p. 22), combined with the great advance in the prices of products. The hopes for better results in the future than have been secured in the past lie in the continuance of high prices, better methods of cultivation, and the introduction and development of more drought-resistant varieties of crops (p. 24).—*A. P.*

Aleppo Pine. By Ch. Flahault (*Rev. Hort. de l'Algérie*, p. 213; June 1911).—The Aleppo Pine (*Pinus halepensis*) grows and flourishes in most of the regions round the Mediterranean, and this article gives a list of its other homes in different parts of Europe. In France it has hitherto been treated rather as the Cinderella among trees, and only spots unsuitable to other growth have been given up to it, though it is made use of to prepare the way in hitherto barren places for more favoured vegetation. Even in poor soil it has managed to grow, but deeper and better soil would produce finer specimens. The tree appears to be really of value, and cultivators are beginning to appreciate this fact. It grows and propagates itself fast; it will stand almost anything but damp; its wood may be used as pit-props and as masts for ships. It has been found that the value of various products produced by tapping may make it a considerable source of income, and the bark contains a high proportion of tannin.—*M. L. H.*

Almond, Culture of. By A. de Mazière (*Rev. Hort. de l'Algérie*, p. 6, Jan. 1911, and p. 271, Aug. 1911; plates).—Notes on the cultivation and uses of the various sorts of almond, giving information on propagation, planting, cultivation, budding, and pruning the trees. As little pruning as possible is recommended as a rule, but a method of grafting old and unproductive trees is described.—*M. L. H.*

Almond, An, without Shell, 'Tonton Phouse.' By Pierre Passy (*Rev. Hort.* pp. 566-7; Dec. 16, 1911).—A description of an almond which has merely a parchment-like covering, which splits when ripe, exposing the kernel in an almost circular nut, which after two years' keeping has remained in perfect condition and quite edible. The flavour is good, equal to the best varieties for dessert. The origin is peculiar, the tree having been grown as a graft from a series supplied by an old vine-grower near Clermont, who was regarded by his neighbours as something of a maniac, owing to his attempts at what they considered impossibilities. The original tree appears to have been lost sight of. The peculiar name has been given by the owner of the present specimen, which was exhibited by the Puy de Dôme Horticultural Society, Oct. 10, 1909.—*C. T. D.*

Alpine Scree and Shingle-Plants, Growth Forms of. By G. Hess (*Beih. Bot. Cent.* Bd. 27, Abt. ii. Heft i., pp. 1-170; 37 figs.).—

A special study of this particular association, "Geröllpflanzen," which should be consulted by all ecologists. The physical conditions are very thoroughly examined. The habitats are divided first into weathering detritus, gravel-heaps, watercourses on gravel-heaps, Lawinen on gravel or screes, Lawinen at the foot of gravel-heaps, and these are subdivided into schistose, granitic or dolomitic, &c., or eugogenous and dyseogenous, siliceous and calciferous rocks. The characteristic root forms and renewal shoots, &c., are also fully described. Then follows a full description of the fifty-five characteristic plants, followed by an abstract showing habitats and renewal shoots, &c., of each of them.—*G. F. S. E.*

A new species of Alternaria. By L. L. Harter (*Mycologia*, iii. p. 154; 1911).—The leaves of *Forsythia suspensa* were found in Washington diseased, apparently through the attack of a species of *Alternaria*, for which the specific name *Forsythiae* is proposed. The spots occurred on the surface of leaf, were sub-circular, grey or greyish-brown, and margined by dark brown. The spots were marked with concentric circles.—*F. J. C.*

Anthyllis (Section Vulneraria). By W. Becker (*Beih. Bot. Cent.* Bd. 27, Abt. ii. Heft 2, pp. 256-87).—A detailed description and discussion of the species, sub-species and little species of the group *Anthyllis Vulneraria*. The author's classification differs from that adopted by others. As regards colour, he believes that the red colour of the petals was predominant in the Tertiary period, and pale colouring is connected with cooler climate and also with an inland as compared with a sea habitat.—*G. F. S. E.*

Anthurium with Black Flowers (*Oestr. Gart. Zeit.* vol. vi. pt. xii. p. 467).—*Anthurium watermaliense* bears shining black flowers. The spadix is white, pale brown at the end.—*S. E. W.*

Ants, To Destroy. By J. Salom (*Rev. Hort. de l'Algérie*, p. 77, March 1911); and by F. Fournot (*Rev. Hort. de l'Algérie*, p. 287, Aug. 1911).—Various methods of destroying or checking the harm done by ants are described in these two articles. In the spring, when the little heaps thrown up by ants are first noticed, cover them with flower-pots. The warmth inside the pot will bring all the ants into it in the course of a day or two, when the trap may be visited and the ants destroyed with a mixture of a wineglassful of creasol or creasote to ten litres of water. At the same time the heap should be well stirred up with a stick and watered with the same mixture. This mixture may be made one-quarter stronger without injuring plants or flowers. A few drops put at the entrance to the ant-hill also has a good effect. If it does not kill the ants its smell drives them away.

To prevent their ravages in trees put a woollen bandage round the trunk of the tree about a yard from the ground, which will discourage them by entangling their feet as they try to mount to the leaves, and

a powdering of pyrethrum powder just above the woollen bandage will banish the pest completely. Pyrethrum powder may also be scattered among the stems of any plant attacked by ants with good effect.

M. L. H.

Aphididae of Illinois, with Notes on some of the Species, List of. By J. J. Davis (*Jour. Econ. Entom.* iii. pp. 99; figs.).—This paper is a continuance of that noted in JOURNAL R.H.S. xxxvii. p. 612.—*F. J. C.*

Aphelandra Fascinator (*Bot. Mag.* t. 8398).—Tropical South America. Family, Acanthaceae; tribe, Aphelandreae. Under-shrub. Leaves elliptic, to 8 inches long, semi-glabrous, dark-green above, with silvery bands along the midrib and main nerves. Spikes, dense. Corolla brilliant scarlet, tube 1½-2 inches long.—*G. H.*

Apion, with Notes on Related Forms, An Injurious North American species of. By F. H. Chittenden (*U.S.A. Dept. Agr., Bur. Entom., Bull.* 64, pt. iv. Jan. 1908; 1 fig.).—Certain European forms of *Apion* are sufficiently abundant to receive common English names, among which are the clover weevil, the Dutch clover yellow-legged weevil, the tare or vetch weevil, the popular name indicating the insect's food preference. None of the American species have hitherto been recorded as injuring useful plants, but in 1899 records were received of injuries to forage plants by *Apion griseum* Sm., and in 1903 Dr. Edward Palmer furnished specimens of *Apion colon* Sharp collected at Alvarez, San Luis, Potosi, Mexico, on a species of wild bean.—*V. G. J.*

Apple 'Carrington.' By W. J. Allen (*Agr. Gaz. N.S.W.* vol. xxii. pt. vi. p. 522; 1 coloured plate, 2 figs.).—'Carrington Red' is more valuable than Carrington streaked. It is an early apple, thriving in sandy loam in the coastal districts. It is prolific, bearing on the tips, and is proof against American Blight. The fruit does not keep well.—*S. E. W.*

Apple Culture in Ohio. By F. H. Ballou (*U.S.A. Exp. Stn., Ohio, Bull.* 217; May 1910; 17 figs.).—Years ago, when soils were virgin and insect pests a rarity, apple-growing was very prosperous in this State, but with the advent of difficulties it fell into a very neglected condition. Great attention is now being bestowed on its reconstruction, and this bulletin deals with the subject very fully, both as to the planting of new orchards and the renovation of old ones. Remarkable instances are given of success in the latter direction. See also Bulletin 224 of December 1910, dealing with the rejuvenation of orchards in this State, mainly as regards spraying experiments.—*A. P.*

Apple, Insect pests and diseases of the (*U.S.A. Exp. Stn., Maine, Quart. Bull.* vol. x. No. 3; Sept. 1911; 2 plates).—The necessity of thorough spraying with good-quality materials properly mixed is

insisted on. Arsenate of lead is recommended as an insecticide for caterpillars generally, in preference to Paris green, on account of its great adhesive qualities and the fact that it can be used at any strength without burning, and has some fungicidal value when added to lime-sulphur solutions.

An infusion of tobacco as a contact insecticide for plant lice, slugs, and thrips is rapidly gaining favour, as it is effective and does not burn the foliage.—*V. G. J.*

Apple Orchard, Is it necessary to Fertilize an? By W. P. Hedrick (*U.S.A. Exp. Stn., New York, Bull.* 339; July 1911; 4 plates, 7 figs.).—This is a report of a fifteen-year experiment to determine whether apple orchards benefit by manuring. There were twelve plots of standard trees, the variety in every case being the 'Rome' top-worked on 'Ben Davis.' The 'Rome' buds all came from one tree, and the stocks were selected carefully so as to exclude individual variations as far as possible. The fertilizers had no sensible effects upon the yield of fruit, though the size of the apples may have been slightly increased.—*A. P.*

Apple 'Yellow Bellefleur.' By A. Janson (*Oestr. Gart. Zeit.* vol. vi. pt. xii. pp. 455-7; 1 plate).—This apple soon arrives at fertility and bears large fruit on the end of the branches. The apples are ready from November to March. The tree does best in good moist soil. It blossoms late and bears large crops. On dry ground it is subject to mildew.—*S. E. W.*

Apples, New. By W. J. Allen (*Agr. Gaz. N.S.W.* vol. xxii. pt. v. pp. 418-9; 1 coloured plate, 2 figs.).—'Worcester Pearmain' and 'McIntosh Red' do well in New South Wales.—*S. E. W.*

Asparagus Beetles. By W. J. Goverts (*Gartenflora*, vol. lx. pt. xv. pp. 336-7; 1 fig.).—*Crioceris asparagi* and *C. duodecimpunctata* can be destroyed in the early morning by shaking the plants over a wide-necked bottle into which a funnel is fitted.—*S. E. W.*

Asparagus Miner, The. By F. H. Chittenden, Sc.D. (*U.S.A. Dept. Agr., Bur. Entom., Circ.* 135; March, 1911; 2 figs.).—In recent years the stalks of asparagus have been reported considerably injured by the larva of a small black fly, to which the name of Asparagus miner (*Agromyza simplex* Loew) has been given. The larva mines beneath the epidermis of the stalk, and when it has transformed to the puparium stage the thin outer skin becomes more or less ruptured, and the presence of the insect is discovered easily. Prior to 1896 nothing was known of its habits. It is an American species, and evidently restricted to asparagus as a food plant.

It does not appear to be a very serious pest.—*V. G. J.*

Aspens: their Growth and Management. By W. G. Weigle and E. H. Frothingham (*U.S.A. Dep. Agr., Forest Service*

Bull. 93).—These are valuable trees as growing up rapidly and clothing deforested areas, while they all produce large quantities of timber which, though of no particular value, is yet largely used for constructive purposes and pulpwood. Eleven species are natives of North America, but to two only is the name of aspen commonly given.

The notes on the management of the poplars as forest trees are particularly interesting, and that on pulpwood logging gives an insight into this ever-extending operation.—*A. D. W.*

Azalea indica, Best Varieties of (*Rev. Hort. Belge*, p. 32, Jan. 15, 1911; and p. 65, Feb. 15, 1911).—The Committee of the Société l'Avenir Horticole de Gand have organized a referendum among their own members and as many other growers as could be got to answer on the subject of the best varieties of *Azalea indica* from various points of view.

The referendum was a success. Over 200 answers were received by the Committee, which analysed give the following results:—

The ten best varieties in order of merit for:—

A—Cultivation: 'M. Van der Cruyssen,' 'Niobe,' 'Professor Wolters,' 'Vervaeneana,' 'Simon Mardner,' 'Deutsche Perle,' 'Pres. O. de Kerchove,' 'John Llewelyn,' 'Mme. Petrick,' 'Paul Weber.'

B—Sale: 'Vervaeneana,' 'Mme. Van der Cruyssen,' 'Mme. Petrick,' 'Pres. O. de Kerchove,' 'Deutsche Perle,' 'Niobe,' 'Professor Wolters,' 'Simon Mardner,' 'John Llewelyn,' 'Deschryveriana.'

The best early var.	White	A. For bloom	'Deutsche Perle'
		B. „ culture	„
		C. „ sale	„
	Red or Pink	A. „ bloom	'Mme. Petrick'
		B. „ culture	'Mme. Van der Cruyssen'
		C. „ sale	'Mme. Petrick'
The best late var.	White	A. „ bloom	'Niobe'
		B. „ culture	„
		C. „ sale	„
	Red or Pink	A. „ bloom	'Mém. de L. van Houtte'
		B. „ culture	„
		C. „ sale	„
	Striped or blotched	A. „ bloom	'Paul Weber'
		B. „ culture	'Impératrice'
		C. „ sale	„

M. L. H.

Bacteria of Soil. By J. G. Lipman (*Bot. Gaz.* pp. 454-60, June 1907).—Attempts to classify and introduce a new terminology of soil bacteria.—*G. F. S. E.*

Bamboos as Decorative Plants. By C. C. Hosseus (*Gartenflora*, vol. lx. pt. xvi. pp. 350-4).—Bamboos require exposure to the sun and an open situation. The following are well worth growing:—*Arundinaria japonica*, *A. anceps* (N. India), *A. Kumasa* (Japan), does well in half shade, *A. Hindsii* var. *graminea* strongly recommended, *A. nitida* (Central China) should be planted near water

in a sunny position, *A. humilis* (Japan), *A. spathiflora* (Himalaya), *A. Simonii* (Japan) does very well near water, *A. Fortunei* (Japan), a well-known variety, *Phyllostachys nigra* (Japan) beautiful when grown as a specimen plant, *P. Quiloi* (Japan) requires sun, *P. flexuosa* very desirable when grown as an isolated plant, *P. viridi-glaucescens* (China) suitable for parks, *P. aurea* (Japan) strongly recommended and requires full exposure to the sun.—*S. E. W.*

Beans, Variation of Varieties of, in their susceptibility to Anthracnose. By M. F. Barrus (*Phytopathology*, i. 6, pp. 190-5).—Various reports have been made that certain varieties of bean were not susceptible to attack by the fungus *Colletotrichum Lindemuthianum.* The author has investigated the question of immunity for a number of varieties and has failed to find one that under all circumstances was capable of resisting the attack of the fungus. He finds different "strains" of the fungus varying from one another in some measure in their powers of attacking bean varieties. *Dolichos sesquipedalis* and *Vicia Faba* were not infected, but *Phaseolus multiflorus* and two varieties of *P. lunatus* were infected as well as a large number of varieties of the bean usually attacked, *P. vulgaris*, the dwarf French bean.— *F. J. C.*

Begonia 'Aurore.' By Charles Pynaert (*Rev. Hort. Belge*, p. 37, Feb. 1, 1911; plate).—A. Toeffart, of Destelbergen-lez-Gand, has produced a new Begonia, a hybrid between *B. socotrana* and *B. Pearcei*, which is said to be a valuable acquisition. The flower is copper-yellow, and the growth of the plant is like that of 'Gloire de Lorraine,' only that the leaves are longer and dark green in colour, and the flowers are larger. The blooms are said to be much less perishable and to carry better than those of some other varieties.—*M. L. H.*

Biological Statistics (*Beih. Bot. Cent.* Bd. 27, Abt. ii. Heft 1, pp. 171-206*d*).—This is a translation of C. Raunkiaer's paper in the "Botanick Tidskrift," Bd. 29, Heft 1. The paper deals chiefly with the statistics of winter buds (upright branches, branches near the earth, close to the soil, under the earth, and annual plants). Stem succulents, epiphytes, large or moderate-sized plants, small plants, and dwarf plants are also distinguished.

The author then tabulates the plants of various floras—Seychelles, St. Thomas, South Labrador, Baffin's Land, &c.—and endeavours to obtain a characteristic climatic series of adaptations. The northern Arctic region is specially treated.

A percentage division of the species, according to life-forms, is shown in these tables. The only general result obtained is a suggestion that there are four chief climates—tropical, sub-tropical (winter rain), cold-temperate, and cold zones.—*G. F. S. E.*

Birds of St. Lucia, Protection of Native. By Austin H. Clark (*West Indian Bull.* vol. xi. No. 3, 1911).—The introduction of the

mongoose, though beneficial in destroying "fer de lance" (*Lachesis mutus*), has also entailed the destruction of insectivorous lizards, thus rendering it essential to protect birds which can take their place as insect-eaters (list of native birds given). Besides these, game birds and plumage birds should also be protected. Among the former, the most beautiful is the native parrot (*Amazona versicolor*). These birds are also the first to be exterminated in their native haunts, and some varieties have completely disappeared from many of the West Indian islands (notably the macaws and parakeets). This is due partly to their characteristic sympathy with a suffering fellow-bird, which renders capture easy, and partly, of course, to their market value as pets. Several doves are likely to disappear, being favourite dainties with the mongoose. Two valuable game birds are the "Crabier" (feeds on pernicious land-crabs) and the "Gree-gree" (eats mole crickets). A few native birds of St. Lucia may be classed as injurious, especially the "poule d'eau," which destroys plantains, bananas, and maize, and might be kept in check but by *trapping only* (when other birds caught could be released).

Collectors' permits should depend upon reliable sponsorship by one of the well-known societies.

The introduction of foreign birds should be prohibited, with possible exceptions in favour of insectivorous birds, such as the Japanese robin (or Pekin nightingale), the Mexican chachalaca, guan, and curassow.

C. H. L.

Botryosphaeria ribis, A Contribution to the Life-History, Parasitism, and Biology of. By J. G. Grossenbacher and B. M. Duggar (*U.S.A. Exp. Stn., Geneva, Tech. Bull.* 18; July 1911; figs.). A disease of currants causing the death of young currant-shoots and the wilting of older branches and parts of bushes during the summer (from May onwards) is described. The fungus which causes the disease is sterile at the time of the death of the affected shoots, but three spore forms later develop on the host. The *Macrophoma* type of spore develops in July on the recently dead shoots. In early summer in the season following the death complex black bodies bearing the second *Dothierella* form of spore break through the bark, and a third type usually appears later. The fungus is described and named *Botryosphaeria ribis*. The spores germinate on artificial media, but the fungus remains sterile. Inoculations were carried out with success. Infection takes place in June and July, and it is recommended that all dead wood should be pruned out in May, so as to reduce the chance of infection. Numerous saprophytic fungi were found on the dead shoots, including *Nectria cinnabarina*, to which the disease had previously been ascribed by some.—*F. J. C.*

Budding. By W. J. Allen (*Agr. Gaz. N.S.W.* vol. xxii. pt. i. pp. 59-66; 11 figs.).—Instructions for budding are given and the following is recommended for wrapping buds:—The waxed cloth is prepared by dipping calico in a melted mixture of beeswax (3), resin (3), and two

parts of mutton tallow. The excess of grease is removed by drawing the calico between two sticks as it leaves the mixture.—*S. E. W.*

Buddleia officinalis (*Bot. Mag.* t. 8401).—China. Family, Loganiaceae; tribe, Euloganieae. Shrub, 2-8 feet high, with numerous branches. Leaves lanceolate 4 inches long. Flowers in dense panicles, or thyrses 3-12 inches long, composed of short, subglobose glomerules. Corolla, pale lilac, with orange throat.—*G. H.*

Bulbs in Park and Garden. By W. Würth (*Oestr. Gart. Zeit.* vol. vi. pt. xii. pp. 457-60).—The following bulbs are recommended for planting in parks and gardens: Crocus (on the lawn), single tulips (such as 'Duc von Thol,' 'Artus,' 'Yellow Prince'), *Galanthus nivalis*, *G. Elwesii*, and *G. cilicus*, *Leucojum vernum*, and *L. aestivum*, *Narcissus poeticus*, *incomparabilis*, *biflorus* and *Pseudo-Narcissus*, *Scilla bifolia*, *sibirica*, *nutans*, *Peruviana*, and *campanulata*, *Chionodoxa luciliae*, *Puschkinia scilloides*, *Muscari botryoides*, *racemosum*, *azureum*, and *plumosum*, *Ornithogalum umbellatum*, *caudatum*, *comosum*, *nutans*, and *pyrenaicum*, *Fritillaria Meleagris*, and *Eranthis hiemalis*.—*S. E. W.*

Bulgaria, Botanizing in. By C. F. Ball (*Gard. Chron.* p. 252, April 20, 1912, and p. 274, April 27, 1912; 4 figs.).—A concise and instructive account of the good plants met with on an expedition to Mount Vitosha, the Shipka Pass, Kasanlik, and the Rilo Mountains, and also in the Royal Gardens at Sofia and Vrana.—*E. A. B.*

Cabbage Root, Effect of Club Root Disease on Ash Constituents of. By H. S. Reed (*Phytopathology*, i. 5, pp. 159-63).—The author shows that much more calcium, magnesium, phosphoric acid, potassium and sulphuric acid are contained in diseased than in healthy roots. The greatest increase is in the potassium, and this is connected with an increase in protoplasm and in starch. The proportion of potassium to sodium is greater in the diseased roots, as is that of calcium to magnesium. The proportion of magnesium to phosphorus remains about the same. The author regards the differences found as sufficient to indicate a definite correlation in the metabolism both of healthy and of diseased plants.—*F. J. C.*

Cabbage Seed Beds, Observations on Screening (*U.S.A. Exp. Stat., New York, Bull.* 334, p. 13; Feb. 1911).—This bulletin gives the results of tests with cheesecloth for the protection of cabbage seed-beds against insect injuries.

The important insects attacking seedlings are the turnip flea-beetle, *Phyllotreta vittata* Fab., which injures the leaves of the young plant; and the cabbage-maggot, *Pegomya* spp., which attacks the underground portion of the plant.

Cheesecloth conserves the moisture, increases the temperature, and in the early season furnishes more congenial conditions for growth. Plants raised under cloth start sooner, grow faster, and obtain the

desired size a week or ten days earlier than plants in the open. The experiments show that screening completely protects the seedlings from maggot injury; also that certain grades of cheesecloth will prevent injury by flea-beetles.

The experience of four years has shown that the use of cheesecloth is practicable. In experiments in protecting plants the cost of screening ranged from six to twenty cents for each thousand.

The screened plants are more tender than those not screened, but experience has shown that by removing the cover a week or ten days before transplanting the seedlings become sufficiently hardened, so that there is very little difference in the growth of the sets in the field.

A. A. K.

Cacao and Hevea Canker. By T. Petch (*Circ. and Agric. Jour. Roy. Bot. Gard. Ceylon*, v. pp. 143-80; 1910).—A review of the ideas as to the origin of the cankers of Hevea and cacao is given and the conclusion arrived at that they are due to the fungus *Phytophthora Faberi.* Accounts of inoculation experiments are given together with the life-history of the fungus. Spraying experiments were carried out, and it is recommended that diseased Hevea bark should be cut out, cacao débris should be destroyed by burning, and spraying with Bordeaux mixture of the bark of Hevea and the fruits of cacao just before the monsoon rains set in should be carried out.—*F. J. C.*

Cacti, Room Cultivation of. By Tittmann (*Gartenflora*, vol. lx. pt. xvi. pp. 345-50).—Cacti can be preserved in the house through the winter by planting in a box three or four inches deep. It is preferably made of oak, provided with holes for drainage and with a projecting piece of wood at each corner. When the Cacti are planted, a frame of lighter wood is superposed and held in position by the corner pieces. This frame slopes from back to front and is closed by a sheet of glass. In this way the plants are protected from dust and from sudden changes of temperature. About the middle of April the cases are taken out of doors and shaded. Air is admitted. In summer the plants are carefully watered; when their growing time is over they are hardened off and no more water is given and the cases are brought into the house again for the winter.—*S. E. W.*

Caladium pubescens (*Bot. Mag.* t. 8402).—Peru. Family, Aroideae; tribe, Colocasieae. Herb. Tuber globose. Leaves, 8-12 inches long, pubescent. Spathe 5-6 inches long, velvety-pubescent, pale green. Spadix, $3\frac{3}{4}$-4 inches long, yellowish blue to milk-white above.—*G. H.*

Medullary Spots, A Contribution to the Life-History of some Cambium Miners. By J. G. Grossenbacher (*U.S.A. Exp. Stn., Tech. Bull.* 15; Nov. 1910; 5 plates).—During investigations of a fungus which causes a blight of *Ribes vulgare*, dark-brown streaks were frequently observed in living young canes during late summer.

Streaks or mines of the same type were also found on *R. nigrum* and *R. Grossularia.* During the past summer insect larvæ were secured from both Ribes and trees, but the Ribes-miners differed much from the tree-miners, though superficially they appeared similar. Those from Ribes proved to be caterpillars of a Tineid moth, and were identified by A. Busch as *Opostega nonstrigella* Ch.—*V. G. J.*

Cameroon, Some useful Woods of. II. Leguminosae. By H. Harms (*Not. König. Bot. Berlin, Appendix* xxi. No. 2; pp. 9-75; July 1911; with text-figs.).—An account is given of the various collections which have been made of the leguminous woods of the Cameroon district. It is pointed out that great precaution is necessary in making such a collection. It is not sufficient to label each specimen with the local name of the tree, as these names are usually not precise, but often include a number of different species or even genera under a single denomination. It is necessary, when collecting a specimen of wood, to gather at the same time representative material of the leaves, flowers, and fruits of the tree, so that each block of wood is accompanied by sufficient herbarium material to ensure the correct identification of the tree from which it is derived. Harms states that transverse sections are the most valuable in distinguishing these woods. The form in which the wood parenchyma is distributed amongst the fibrous tissue is very important in the *Leguminosae.* Tangential sections also afford valuable information regarding the form and height of the medullary rays, which are often of importance in the determination of the wood. A large number of species of leguminous trees from this part of Africa are then described and the character and economic importance of their wood referred to. Many excellent figures both of the leaf, flower, fruit, &c., of the tree, and also (semi-diagrammatic) of sections of the wood, accompany the text.—*R. B.*

Campanula longistyla parviflora. By D. Bois (*Rev. Hort.* pp. 548-9; Dec. 1, 1911; coloured plate and illustration).—The plate represents a very handsome inflorescence of deep mauve flowers about one inch long; and the illustration, a pot plant showing a very floriferous specimen of somewhat compact habit about a foot high. Probably hardy, Transcaucasian, but a little winter shelter suggested. MM. Cayeux and Le Clerc, of Vitry (Seine), are the growers.

C. T. D.

Canning Peaches on the Farm. By H. P. Gould and W. F. Fletcher (*U.S.A. Dep. Agr., Farmers' Bull.* 426, 1910).—As in all fruit-producing areas, a good season for peaches often means a glut in the market and low prices, so that a canning equipment is a great stand-by to the grower.

This bulletin is not meant for the expert canner, but gives preliminary information where required.

The most important point in the whole matter is the complete sterilization of both the can and its contents in the final operation of the canning process. Success or failure depends upon this.

The type of canning apparatus which comes within the scope of this bulletin is generally portable, and costs from $5 to $75.

Various means of facilitating and simplifying the process are adopted, but in the main the procedure is as follows: The peaches are prepared by being peeled, halved, and stoned. The cans are then filled (by hand for dessert fruit, by machinery for lower grades), and sugar added, either in the form of syrup, or dry; they are finally closed, using either solder or patent caps.

If the fruit is canned cold, it is usual to "exhaust" the cans by submersion in boiling water for five minutes, which expels the air, and then to seal the small hole with solder. Last, but most important, is the "processing"—*i.e.* cooking or sterilizing—which consists in completely submerging the cans beneath boiling water until the fruit is cooked and all germs destroyed.

Any leaks should be carefully noticed and stopped with solder. The length of time required varies with size of can and degrees of ripeness and quality.

Specimen cans should be inspected from time to time in case the treatment required to be modified, "processing" being a very critical operation, and requiring skill and judgment.—*C. H. L.*

Cardoon, A Spineless. By L. Trabut (*Rev. Hort. de l'Algérie*, p. 1, Jan. 1, 1911).—A note on a spineless variety of cardoon which has been noticed at Djebel Ouach in Algeria and is now removed to a botanical station where it is under observation. The wild cardoon, *Cynara Cardunculus*, is extensively cultivated by the Arabs, and a spineless variety was once shown to the writer of this article in a native garden, the owner declaring that he had raised it among a lot of ordinary seedlings. This was not credited at the time, but it seems probable after all that *C. Cardunculus* does occasionally produce spineless specimens, which, being unprotected, fall a prey to cattle in the wild state, but which might become, under cultivation, the parents of a true spineless strain. Spineless varieties of *Opuntia* are already known to exist in places where their inaccessibility to cattle allows them to survive.

The wild *Cynara* assumes certain local forms in isolated stations which have received specific names. A descriptive list of these is added.—*M. L. H.*

Castanea, Essay on the Classification of the Genus. By D. Bois (*Jour. Soc. Nat. Hort. Fr.* p. 580, Nov. 1911).—A review on a monograph with this title by M. Lavialle, which is said to be both interesting and valuable. The author has studied sixty varieties of *C. sativa*, the cultivated chestnut, which he places in three groups, divided according to the shape of the fruit. He gives a careful detailed account of each variety, both of the tree itself and of the fruit, fresh and dry, and adds information on its geographical distribution, its hardiness, its productiveness, the period of maturity of its fruit, and its economic value.

In considering native varieties M. Lavialle only accepts two types—*C. silvestris macrocarpa* and *C. silvestris microcarpa*. From the first of these comes the cultivated chestnut. He also devotes some pages to exotic species.—*M. L. H.*

Caterpillars, Bag Shelter. By W. W. Froggatt (*Agr. Gaz. N.S.W.* vol. xxii. pt. v. pp. 443-7; 2 plates).—The caterpillars of *Teara contraria* and *Ocinaria lewinae* do great damage to *Acacia pendula* and *Eucalyptus*. Their nests should be destroyed, but care must be exercised in doing so, as the hairs contained in them cause a painful rash if they come in contact with the skin. Horses feeding on pasture swarming with these hairy caterpillars suffer from ulceration of the mouth, which sometimes causes their death.—*S. E. W.*

Celmisias. By C. H. Curtis (*Gard. Mag.* No. 3016, p. 609, Aug. 19, 1911; plate).—The genus *Celmisia* is almost entirely confined to New Zealand. It comprises a number of species with large daisy-like flowers, described by those who have seen them in their natural habitat as possessing great beauty, but until recently they have never been successfully grown in this country. At Kew cultural difficulties have been overcome, and a number of species, all of which are described, have been flowered with great success.

It is suggested that when these cultural requirements are still better understood they will be largely grown, and become plants of as great value as has been the case with *Gerbera Jamesoni*.—*E. B.*

Ceratitis capitata, The Orange Fly. By A. de Mazières (*Rev. Hort. de l'Algérie*, p. 330, Oct. 1911).—The orange fly has been increasing of late years and must be combated. It attacks several other fruit-trees besides the orange, which gives it a long period in which to exercise its baneful activities, as it goes from fruit to fruit as they each come into season. The fly lays its eggs in the rind of the orange, so all fallen and affected fruit must be collected and destroyed at once. It has been noticed that when a fly visits a particular orange other flies collect there too. It is, therefore, suggested that any fruit which appears to be attacked should be smeared with a mixture of castor-oil and resin, which will act as a trap to the flies. A method of catching them in basins of water, containing some poisonous mixture, is also described.—*M. L. H.*

Cercis, Length of Pod and Fertility in. By J. A. Harris (*Bot. Gaz.* pp. 117-27, Aug. 1910; 1 fig.).—The author has carried out a biometrical research. Length of pod and number of ovules in each are distinctly correlated. The number of seeds developing is also related to the length of the pod, as well as to the number of ovules in a pod. Of a total gross correlation of .500 between length of pod and number of mature seeds, .300 is due to some morphogenetic or physiological relationship between the number of seeds developing and the length of the pod.—*G. F. S. E.*

Chalk-hating Plants (*Rev. Hort. de l'Algérie*, p. 171, May 1911). Certain plants which dislike chalk may suffer even when planted in suitable soil by being watered with chalky-water when rain-water is not procurable. To prevent this, make two solutions:—

A.—Oxalate of potash	300 gr.
Water	1 litre
B.—Sulphate of iron	300 gr.
Water	1 litre

When required for use, mix the two solutions in equal parts and add at the rate of 1 litre of the mixture to the cubic metre of water. This will have the effect of rendering the carbonate of lime in the water insoluble, and therefore harmless to the plants.—*M. L. H.*

Chestnut Telephone and Telegraph Poles, Damage to, by Wood-boring Insects. By Thomas E. Snyder, M.F. (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 94, pt. i. Dec. 1910; and *Circ.* 134, March 1911; illus.).—The author describes the telephone pole-borer (*Parandra brunnea* Fab.), which insect does the greatest amount of damage to the poles, though the white ant is responsible for considerable injury.

Treating the poles with various preservatives has proved to be temporarily efficient in keeping out wood-borers if the work is thoroughly done, and not only the butt, but also the basal area is treated.

Impregnating the poles with creosote is the most satisfactory method, and will prevent attacks for at least five years.—*V. G. J.*

Chrysanthemums in pots, Soil preparation. By P. Cragg (*Gard. Mag.* No. 3032, p. 913, Dec. 9, 1911).—The subject of soil preparation was dealt with at some length in a lecture before the National Chrysanthemum Society. During a wet season it was found that a large number of Chrysanthemums failed owing to overfeeding, and this led to a number of experiments in the preparation of the soil to be used for potting, so as to eliminate the risk of improper supplies by the application of different crude manures as the plants grew. The soil to be treated was carefully analysed with a view to ascertain the percentage of phosphoric acid, potash, nitrogen, and lime, these being looked upon as the four chief necessaries provided the soil itself was of a good rich nature. The desirable amount of these was then fixed upon, and to every 100 tons of earth as stacked were added the necessary additional quantities of lime, basic slag, bone meal, ground hoof, and soot. Of course different soils need different treatment, but the idea is to raise the percentages of the different elements necessary to plant-life until a well-balanced compost is obtained, and further to have them present in such forms that a *constant* succession of complete food is available. The treatment for forming a turf for future use is also described with a view to building up its constituents for a number of years ahead.—*E. B.*

Chrysomphalus dictyospermi in Algeria. By L. Trabut (*Rev. Hort. de l'Algérie*, p. 57; March 1911).—The question of the

alarming spread of harmful insects through the importation of infected stock is beginning to attract the attention of cultivators and politicians in Algeria. The Ficus trees which line the boulevards in Algiers have been seriously injured by an invasion of red scale. *Chrysomphalus*, after spreading over Southern Spain, the Riviera, Corsica, Sicily, and Liguria, is now invading North Africa. It is the more to be dreaded that it appears to attack indifferently every green tree that grows: Orange, Palm, Yucca, Agave, Aloe, Ficus, Lemon, Ivy, Aralia, &c.

Instant destruction of all infected plants is the only certain method of checking the ravages of this pest, and unfortunately it is suspected that it has already found a breeding-ground in the ivy which is so common in the country round Algiers. In orange-gardens fumigation with hydrocyanic acid is recommended, and lime-sulphur sprays may also be tried, but cultivators are anxiously awaiting more stringent laws against the importation of infected stock, more adequate inspection of nurseries, and compulsory destruction of diseased trees.—*M. L. H.*

Cirsium, Mexican and Central American Species of. By Herr Fr. Petrak (*Beih. Bot. Cent.* Bd. 27, Abt. ii. Heft 2, pp. 207-55; 2 plates).—Gives a careful description and critical discussion of the systematic characters of the twenty-five species of this genus found in the above region. There is also an analytical key to the species.

G. F. S. E.

Citrus aurantium, A Variety of Cladosporium herbarum on, in Florida. By H. S. Fawcett and O. F. Berger (*Phytopathology*, i. 5, pp. 164-6).—A variety of *Cladosporium herbarum* for which the authors propose the name var. *citricolum* has been isolated from 'scaly bark' of oranges. On inoculation with the fungus the disease has been reproduced on small branches of the orange. The fungus passes through the *Hormodendron* stage, produces microsclerotia, and developed a 'packet spore' or *Coniothecium* stage. (See also *U.S.A. Exp. Stn. Florida, Bull.* 106.)—*F. J. C.*

Citrus, Reputed Hardy Orange (*Gard. Chron.* p. 170, March 16, 1912; with fig.).—A variety of Japanese origin, known as Satsuma, Oushin, and Kii Seedless, sent by Messrs. T. Rivers and Son.

E. A. B.

Clematis chrysocoma (*Bot. Mag.* t. 8395).—China. Family, Ranunculaceae; tribe, Clematideae. Shrub, of low stature. Leaves, 3-foliate. Flowers, solitary or 2-3. Sepals 4, ¾ inches wide; white with a rosy margin.—*G. H.*

Clusia grandiflora (*Bot. Mag.* t. 8387).—Guiana. Family, Guttiferae; tribe, Clusieae. Shrub, 10-20 feet in height, epiphytic. Juice yellowish. Leaves, opposite, 6-12 inches long, 3-6 inches wide, glabrous, dark green. Cymes terminal, 2-3 flowered. Male, sepals

6, white with rosy margins, in 3 pairs, outer, smaller; petals, 8 white, rosy at base, 2½ inches long, 2 inches wide; stamens, about 500, ivory-white with an awl-like appearance. Staminodes, many. Female, ovary, subglobose, stigmas, 14-15.—*G. H.*

Codling Moth and Plum Curculio, The One-spray Method in the Control of. By A. L. Quaintance, E. L. Jenne, E. W. Scott, and R. W. Brancher (*U.S.A. Dep. Agr., Bur. Ent., Bull.* 80, pt. vii. (revised), March 1911; 2 plates, 5 figs.).—In the calyx end of the young apple there are two cavities, one above and one below the stamen bars or filaments, and it is believed that in the Western States the great majority of codling moth larvae, in seeking entrance at the calyx end of the apple, enter through the lower calyx cup, and thus mostly escape destruction unless the poison is placed there, which does not generally happen with ordinary mist sprays. In the arid valleys of the West, as in Utah, Washington, and Colorado, practically the only important insect enemy of the fruit of the apple is the codling moth, fungous diseases being on the whole of little importance. The results of one season's experiments go to show that in such circumstances very satisfactory results may be obtained from a single thorough spraying, or rather drenching, directed from above into each and every fruit cluster by means of an elbow or crook between the rod nozzle to incline the latter at an angle of from thirty degrees to forty-five degrees (p. 114). Though in the East the codling moth larvae have been shown to feed in the outer calyx cup, great benefit would still accrue from a more thorough first spraying than is usually given, but the presence of fungous diseases there as well make the one-spray method impracticable.—*A. P.*

Codling Moth Control in California. By C. W. Woodworth (*Jour. Econ. Entom.* iii. pp. 470-3, Dec. 1912).—Spraying with lead arsenate is adopted on a large scale in California against codling moth, but the ordinary brands are found to produce scorching of the foliage owing to the fogs which visit the apple-growing districts almost daily. A special brand of lead arsenate, containing no ammonia-soluble arsenic has been obtained which has solved the difficulty.—*F. J. C.*

Codling Moth, Recent Experiments with the. By E. P. Felt (*Jour. Econ. Entom.* iii. pp. 474-7).—A large second brood raised the number of apples attacked by this pest enormously in 1910. The percentage of clean fruit on the sprayed trees (lead arsenate 6 lb., water 150 gallons), was 97 per cent. to 57 per cent., on the unsprayed 43 per cent. to 28 per cent. The percentage of benefit was far less than in 1909 (see JOURNAL R.H.S. xxxvii. p. 242), partly owing to the fact that the codling moth was far more abundant in 1910. The author draws attention to some other factors interfering somewhat with the results.—*F. J. C.*

Coelogyne (*Oester. Gart. Zeit.* vol. vi. pt. vii. pp. 245-52, and pt. xii. pp. 444-50; 4 plates; continuation).—The geographical dis-

tribution of the species of *Coelogyne* is described, and also the date of their introduction into Europe.—*S. E. W.*

Coffee-Bean Weevil, New Breeding Records of the. By E. S. Tucker (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 64, pt. vii.; Aug. 1909; 1 plate, 1 fig.).—While making field observations upon the cotton-boll weevil during 1908 the writer's attention was drawn to the work of strange weevils occurring in dried cornstalks in fields adjacent to cotton. The specimens were identified as the coffee-bean weevil (*Araecerus fasciculatus* De Geer), and the selection of cornstalks for breeding purposes places the species on record as a new enemy of corn-fields. Previously published records show it to be a common insect in warm climates, and that it has no particular food preference.—*V. G. J.*

Colorado Ant, Notes on a. By H. O. Marsh (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 64, pt. ix.; Oct. 1910).—A medium-sized ant (*Formica cinereorufibarbis* Forel) is one of the most common species occurring in the vicinity of Rocky Ford, Colorado.

As the ants are usually found on aphis-infested cantaloup vines, many growers are of the opinion that they are largely responsible for the spread of the aphides from one vine to another.

Watering the nests with a solution of 98 per cent. cyanide of potassium (half an ounce to a gallon of water) repeated four times during August and September was entirely successful.—*V. G. J.*

Colour Charts. E. A. Bunyard (*Gard. Mag.* No. 2984, p. 15, Jan. 7, 1911).—The advantages of "Code des Couleurs," by Kluigbsieck and Valette, are considered greater than "Le Répertoire des Couleurs." In the "Code" the colours are arranged according to the spectrum, a standard tint being taken; the same colour is shown with definite amounts of black, yellow, or other pigment added or eliminated. In this way some 720 different colours are shown. The following advantages of the "Code" over the "Répertoire" are claimed:—

(1) A small book to go in the pocket, 8vo.; (2) colours found instantly; (3) colours are fixed, not loose sheets; (4) colours are a nearer approach to natural pigments; (5) colours not named, but referred to by numbers only.

It is hoped that in any revision the good points of both should as far as possible be combined.—*E. B.*

Corn Clubs, Boys'. S. A. Knapp and O. B. Martin (*U.S.A. Dep. Agr., Bur. Pl. Ind.*, "A" 74, p. 7; March 1911; 5 illustrations, 1 plate).—This pamphlet deals with one of the methods used to stimulate interest in agriculture. The boys who are members of the club agree to plant one acre with maize. The American Department of Agriculture sends hints from time to time on the management of these plots. Valuable prizes are awarded to those obtaining the best results.
W. W.

Cotton Anthracnose, The Perfect Stage of the. By C. W. Edgerton (*Mycologia*, i. p. 115; 1909).—The author discovered the mature form of the fungus *Colletotrichum gossypium* on cotton bolls after a period of very warm and very wet weather. He proposes the name *Glomerella gossypia* for it, and describes it. He suggests the possibility that the forms now included under the genus *Glomerella* may possibly find a resting-place in *Physalospora*.—*F. J. C.*

Cotton-Boll Weevil in 1909, The Status of the. By W. D. Hunter (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 122; Dec. 1910; 1 map).—The weevil is spreading to the east and north. Practically all the State of Louisiana is within the infested area.

Although the advance to the east and north seems to be certain, it is only with great difficulty, if at all, that the weevil can make its way westwards.

In the high open plains of Western Texas, where cotton production has enormously increased during the last ten years, the weather conditions will probably serve as an effective barrier against the weevil. Added to this, there is very little timber in which the insects may obtain shelter from the severe winters, and the dryness of the summers, causing small plants and little shade, will act as an equally strong check.—*V. G. J.*

Cotton, Relation of Drought to Weevil Resistance in. By O. F. Cook (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 220; August 1911).—It has been found that dry weather gives a distinct advantage in the production of cotton in the presence of the boll weevil, which does not prosper during drought because the young larvæ are killed when the infested buds fall off and lie on the hot, dry ground. But, without a supply of moisture in the soil, the same drought that hinders the reproduction of the weevil will also stop the growth of the plants, thus reducing the advantage that might be gained from the dry weather.

If, however, the land is well and deeply cultivated, the roots can obtain sufficient moisture to grow and set their crops during periods of drought.—*V. G. J.*

Cruciferae, Genealogy of the. By Dr. A. von Hayek (*Beih. Bot. Cent.*, Bd. 27, Abt. i. Heft 2, pp. 127-335; 5 plates).—This paper endeavours to classify this order according to phylogenetic origins. The systems of Schweidler, Bayer, Calestani, and others are fully described. The author gives full descriptions of the genera, and discusses the phylogeny of the order.—*G. F. S. E.*

Cruciferae, Nectaries of the. By Prof. Jos. Heinr. Schweidler (*Beih. Bot. Cent.* Bd. 27, Abt. i. Heft 3, pp. 337-90; with 1 plate).—This is an historical and critical study of the type and systematic importance of the cruciferous nectary. The works of Hildebrand, Villani, Velenovsky and Bayer are detailed and discussed. The author then describes the leading types of nectary.

He finds, in accordance with Velenovsky, that the lateral four-gland nectary or Alyssum type represents the ground type of the cruciferous nectary from which all other forms can be obtained by simple modifications, such as enlargement or expansion on the torus, and union of originally separate gland primordials.

The same type of nectary may occur in genera which are not closely allied, and genera which are nearly related systematically may have very different nectaries, so that great caution is necessary in using characters of the nectary in classification.—*G. F. S. E.*

Cucumber Beetles, Notes on the. By F. H. Chittenden, Sc.D. **Biological Notes on Species of Diabrotica in Southern Texas.** By H. O. Marsh (*U.S.A. Dep. Agr.*, *Bur. Entom.*, *Bull.* 82; pt. vi. Dec. 1910; 5 figs.).—The commonest and best known are the striped cucumber beetle (*Diabrotica vittata* Fab.), the twelve-spotted cucumber beetle (*D. duodecim-punctata* Oliv.), and a Western species related to the last, known as *D. Soror* Lec.

All these are of the highest economic importance. In addition, there are several other species which habitually or occasionally affect truck crops, and it is with these that the authors deal.—*V. G. J.*

Cucumis metuliferus (*Bot. Mag.* t. 8358).—Tropical and South-East Africa. Family, Cucurbitaceae; tribe, Cucumerineae. The "Horned" cucumber is a climbing herb. Leaves, 1-4 inches long, cusped; blade 3-5 lobed. Flowers, males in clusters; females, single, corolla 1½ inches wide, yellow. Fruit 2½-5 inches long, 2½ inches thick, oblong, with many thick conical spines, rich scarlet when ripe.—*G. H.*

Cucurbit, A tuberous (Cucurbita perennis). By Ch. Grosdemange (*Rev. Hort.* pp. 455-6; Oct. 1, 1911; 1 fig.).—This plant, a native of Texas, presents many generic anomalies and has been described by Naudin as an apparent mixture of four very different species, of which it presents close resemblances in the roots system, flowers, leaves, and fruit. As young plants appear in the vicinity of the parent, it had been assumed that these originated from an underground rhizome, but as these never appeared when the plants were trained perpendicularly, but only when the branches traversed the soil, an investigation has shown that these branches rooted at the axils where they touched the ground, and that these roots became long tubers provided with several apical eyes whence new plants sprang the following season. The fruits are round and of the size of small apples, dark-green with lighter stripes, and owing to the dry, sunny season of 1911 have been very plentiful. Recommended as a generic curiosity.—*C. T. D.*

Cucurbitaceae, Peg of the. By Crocker, Knight, and Roberts (*Bot. Gaz.* pp. 321-39, Nov. 1910; 6 figs.).—A series of experiments are described from which the authors conclude that "there is no

evidence that gravity acts as a direct stimulus to the lateral placement of the peg." "The peg is to a considerable degree a natural integral part of the plant; it developes on all flanks of the hypocotyl approximately equally." The lateral placement is apparently brought about by the arching of the hypocotyl. Two stimuli aid in the formation of the arch, contact of the coats and gravity.—*G. F. S. E.*

Cypripedium speciosum (*Bot. Mag.* t. 8386).—Japan. Family, Orchidaceae; tribe, Cypripedieae. Herb pubescent, 8-16 inches high. Leaves, 3-4 inches long. Flowers, showy, pale flesh-coloured, veined with rose, about 4 inches across.—*G. H.*

Cynodon ciliaris. J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxii. pt. v. p. 408; 1 plate).—This grass is valuable for fodder.—*S. E. W.*

Cycnoches Egertonianum Batem. var. **viride.** By F. Ledien (*Orchis*, vol. v. pt. viii. pp. 116-9; 1 plate).—*Cycnoches Egertonianum* has purple male flowers and pale green female flowers on the same plant, but the female flowers open a fortnight before the male. The illustration in Bateman's "Orchids of Mexico and Guatemala" is incorrect; two male flowers of a different species of *Cycnoches* are given instead of the female blooms.—*S. E. W.*

Dahlia 'Secrétaire Ch. Schepeus.' By Albert Dervaes (*Rev. Hort. Belge*, p. 7, Jan. 1, 1911; plate).—A new dahlia hybrid, between a giant Dutch peony-flowered and a cactus dahlia, is said to have merit. It makes a low-growing, vigorous plant, which requires no staking, and the flowers are borne well above the leaves on long rigid stems. The flowers are large, slightly incurved, of a brilliant red above and pinkish-lilac streaked longitudinally with yellow beneath.—*M. L. H.*

Demonstrations on State and County Farms. C. P. Norgood (*U.S.A. Exp. Stn., Wisconsin, Bull.* 208, p. 130; May 1911; 10 plates, 3 figs., 7 tabs.).—The aim of the experimenting station is "to present to farmers simple and well-established principles and practices of successful farming in operation in the demonstration-field."

The author gives a short account of how, by means of visits to the farm, organized picnics, and terse lectures, the methods of the demonstration farms are brought to the notice of the farmers. No less than thirteen lines of work are attempted on the farms. Some of the most interesting are among the following: (1) Corn tests—comparison of varieties; methods of curing and storing; (2) seed selection; (8) treatment of grain for diseases; smut, &c.; (10) crop rotation and systems of farming; (13) weed eradication. Great stress is laid on the importance of (1) and (2), and the authors prove conclusively that careful selection and scientific drying and storage amply repay for any extra trouble and expense incurred. The University authorities made germination and growing tests of several samples of seed-corn supplied by farmers of the county, and the results obtained must have been striking object-lessons.

A photograph on p. 13 compares an average sample of station-grown ears of corn with a sample grown by various farmers. The superiority of the station-grown corn is immense.

The diagrams and tables are very instructive, and Table II. is worth copying.

TABLE II.—FARMERS' CORN CONTEST.

OSHKOSH.

Sample No.	Variety.	Storage.	Germination.	Stand.	Yield per acre.
		Five best samples.			
			%	%	
31	'Silver King'	Fire-dried	95·0	90·0	85·7 bushels.
29	'King of Earliest'	Fire-dried	93·0	89·0	78·8 bushels.
24	'Silver King'	Garret	99·0	95·0	77·5 bushels.
18	'Golden Glow'	Old Factory	97·0	91·0	77·1 bushels.
13	—	Garret	99·0	93·0	72·8 bushels.
	Average	. . . . .	96·6	91·0	78·3 bushels. Value $ 39·15 per acre.
		Five poorest samples.			
26	'Flint'	House	—	87·0	27·6 bushels.
5	'Yellow Dent'	House	42·0	32·0	33·3 bushels.
27	'Silver King'	On outside of pumphouse	40·0	60·0	41·7 bushels.
3	'Mixed Dent'	Garret	78·0	58·0	45·7 bushels.
12	'Flint'	Porch	77·0	77·0	50·6 bushels.
	Average	. . . . .	59·3	62·8	39·7 bushels. Value $ 19·85 per acre.
	Loss due to	poor seed . .	.	. .	38·6 bushels. Value $ 19·30 per acre.
		'Silver King.' Fire-dried *v.* dried on outside of pumphouse.			
31	'Silver King'	Fire-dried	95·0	90·0	85·7 bushels. Value $ 42·85.
27	'Silver King'	Dried on outside of pumphouse	40·0	60·0	41·7 bushels. Value $ 20·85.
	Loss due to im	proper storage .	.	. .	44·0 bushels. Value $ 22·00.

The sample number refers to the number given to the corn submitted by the farmer. The germination is obtained by counting the number of seeds, which, after six days' sprouting, at a temperature between 50° F. and 70° F., show "healthy roots and stems." The "stand" is the number of stalks appearing from 150 kernels planted. The table shows the relation between germination and stand. The yield and stand correspond, and, as the stand depends on the germination, which in turn depends on the vitality of the seeds, the value of careful selection and curing is completely demonstrated.

Many other points of interest are raised and fully illustrated by diagrams, plates, and tables.—*W. W.*

Demonstration Work on Southern Farms. S. A. Knapp (*U.S.A. Dep. Agr., Farmers' Bull.* 422, p. 19; Nov. 1910; 4 plates, 1 tab.).—This bulletin deals chiefly with methods for the eradication, or, at any rate, the keeping under control the evil effects of the cotton-

boll weevil. The pest is spreading with increasing rapidity year by year over the whole of the American cotton States.

As yet no successful method has been discovered for the destruction of the pest, but the bulletin offers suggestions for the checking of its ravages. A list is given on p. 9:

(1) Deep ploughing of the soil during the autumn and shallow winter cultivation to air the soil and destroy grass, where there is no cover crop.

(2) Burning of affected buds and destroying all possible hibernating quarters of the weevil.

(3) Planting as early as the climate will allow, using varieties which mature early.

(4) Rotations, especially with leguminous plants, as the weevil lives only on the cotton plant.

The reason for hint No. (3) is the fact that the weevils do not become numerous or destructive before the end of July.

The rest of the bulletin deals with corn cultivation in the Southern States. This branch of agriculture has become so neglected that few farmers obtain a profitable yield from it. The Boys' Corn Clubs are, however, acting as a powerful stimulant on the farmers. There are cases where the boys' plots, worked under State agents and advisers, produced on an average 76 bushels of corn to the acre, whilst their parents' land only averaged 16 bushels to the acre. Such a striking object-lesson must soon produce an awakening.—*W. W.*

Dianthus: four Alpine species. By R. Farrer (*Gard. Chron.* p. 195; March 30, 1912).—Geographical, descriptive, and cultural notes on *Dianthus neglectus*, *D. alpinus*, *D. glacialis*, and *D. callizonus.*—*E. A. B.*

Dimorphism, A New Case of. By Gustave Rivière (*Jour. Soc. Nat. Hort. Fr.* ser. iv. vol. xii. p. 569, Nov. 1911).—A case of dimorphism is reported by M. Rivière from Cyr-en-Arthies (Seine-et-Oise). In this case a cider apple, of the variety known in that district as 'Senlis,' and which bears yellow fruit, bore red fruit this year on young shoots which were evidently not the result of grafting. Other cases of the same nature are recalled. Smooth peaches were observed on a tree which had always hitherto borne normally downy fruit, and an apple of the yellow variety, known as 'Ménagère,' suddenly developed red fruit on some branches.—*M. L. H.*

Douglas Fir, The Growth and Management of, in the Pacific North-West. By Thornton T. Munger (*U.S.A. Dep. Agr., Forest Service, Circ.* 175).—In the Pacific North-West the Douglas Fir is of extremely rapid growth, and yields enormous crops of timber. It is interesting to record that in various parts of Britain the Douglas Fir succeeds well, and produces valuable wood, which is being experimented with for various purposes. The tables of rate of growth and quantity of timber produced are interesting and valuable, while illustrations of

the tree in close plantations show to what a large size the Douglas Fir attains in stated periods of time. This report is rendered of special value to British foresters, as the tree is likely to be largely planted in the future.—*A. D. W.*

Dracocephalum argunense (*Bot. Mag.* t. 8384).—North-Eastern Asia. Family, Labiatae; tribe, Nepeteae. Perennial herb 1-2 feet high, hairy. Leaves $1\frac{1}{2}$-$2\frac{3}{4}$ inches long, linear to lanceolate. Whorls, 2-6 flowered; corolla $1\frac{1}{4}$-$1\frac{1}{2}$ inches long, violet, villous.—*G. H.*

Drainage, The Principles and Practice of Land. By E. R. Jones (*U.S.A. Exp. Stn., Wisconsin, Bull.* 199; July 1910; 15 figs.). It is estimated that over 7,000,000 acres of land in Wisconsin need draining, and of this one-third consists of muck and peat marshes and two-thirds mostly of wet clays. This bulletin deals fully with the practical work of draining these lands.—*A. P.*

Eichhornia crassipes (Water Hyacinth). By G. Marks (*Agr. Gaz. N.S.W.* vol. xxii. pt. vi. pp. 509-13; 4 plates).—The Water Hyacinth introduced into the rivers on the North Coast (Australia) has become a serious pest, choking up the waterways and rendering the water unfit for drinking purposes. The only remedy is to drag the ponds and rivers, spread the hyacinths on the banks to dry, and burn them.—*S. E. W.*

Electroculture. By E. Pagne (*Rev. Hort. Belge*, p. 196; June 15, 1911).—Important results which have been arrived at lately have given renewed interest to the subject of cultivation by electricity. In the course of years several different processes of applying electricity to agriculture have been tried. Some experimenters have used the electric current as the producer of warmth and light, which may be called the indirect method, and they have asserted that the development of the plant and the formation of chlorophyll was favourably influenced in this way. Others have used the direct method—that is, they have exposed the plants to the direct influence of the mysterious action of the current without the apparent production of either light or heat.

To apply this last method it is possible to have recourse either to artificial or natural electricity. The first of these is obviously the most costly agent, and its use is only possible when the cultivator is in the neighbourhood of a system of electric wires. The second is within the reach of every purse, and in the electricity furnished by Nature (in soil and atmosphere) we may find an inexhaustible source of energy. It happens, therefore, that it is on the lines suggested by the well-ascertained phenomenon of the accelerated growth of vegetation after a thunderstorm, that the latest experimenters with electricity in plant-cultivation have worked. This article mentions the names of several earlier investigators and then gives a detailed description of an apparatus invented by Lieutenant Basty of Angers, with the results of his

experiments. This apparatus consists of an iron rod tipped with an unoxidizable point. It is driven into the ground among the crop which it is designed to accelerate, its height above ground being in proportion to the height of the crop. It must be 2 metres high for cereals, for instance, and only 0m.80 for low plants such as strawberries and spinach. Its diameter is in proportion to its height and varies between 2 and 5 millimetres. The length of rod below the surface of the soil must depend on the vertical development of the root-system of the plants to be treated.

Theoretically the apparatus is efficacious over a space equal to a circle drawn with the base of the rod as centre and a radius measured by its height, but in practice it will be found better to plant the rods closer to each other than this would necessitate.

Its working is explained by the property of "points." The electric potential of the soil never being in equilibrium with the potential of the atmosphere, there is in the neighbourhood of the points a constant exchange of the two electricities which creates a sort of atmosphere of storm. This produces a constant discharge, feeble it is true, but sufficient to provoke the formation of ozone and to produce a series of advantageous modifications in the composition of the air. At the same time the electric current accumulates at the base of the rod and decomposes the electricity from the molecules of the surrounding soil—slowly if the soil is dry and therefore a bad conductor, more rapidly if it is wet.

Thanks to the action of the apparatus there is a slow decomposition of the electric fluid without sparks—that is, without any violent effect which could hurt the tissues of plants. The action of the rods will be interfered with if they are surrounded with trees, shrubs, poles, &c. taller than themselves, as these last will act also as lightning conductors and attract the atmospheric electricity to themselves. It is considered that this apparatus has a future before it. It has been proved to be efficacious, it is cheaply installed, and costs nothing to keep up. M. Basty himself conducted a series of experiments on a bit of poor land to which no manure was added, and which he divided into two parts. On one he planted a series of seeds, tubers, &c., with no preliminary treatment, and the other was first electrified by his apparatus, the current being a continuous one of an intensity of 4-10 amperes and 6 volts, the same crops being afterwards planted.

As a result spinach, peas, strawberries, &c., were gathered on May 15, on the electrified plot, while three weeks later no crops had yet been gathered from the untreated ground. The proportion of yield between the two plots was as 4-4½ to 1 in favour of the electrified plot, and this last gave produce of a much higher quality. M. Basty is preparing a work on the subject.—*M. L. H.*

Embryo-sac and embryo of Angiosperms, A new series of researches. By M. Treub (*Ann. Jard. Bot. Buit.*, ser. ii. vol. ix. pt. i. pp. 1-17, 1911, with plates i.-v.).—This investigation deals

with the two species *Garcinia Kydia* and *G. Treubii*. With regard to the former species a great deal of doubt exists whether its flowers are hermaphrodite or whether the plant is dioecious. Treub now shows that *G. Kydia* is hermaphrodite and that fertilization takes place in quite a regular manner. The archesporial cell of *G. Kydia* becomes directly the mother-cell of the embryo sac. The four cells of the tetrad arising from the division of the embryo-sac mother-cell are not arranged in a single row, but usually the two uppermost cells lie side by side. The lowest cell of the tetrad gives rise to the embryo-sac, whilst the other three cells degenerate. The nucleus of the embryo-sac divides, and the daughter nuclei take up their position at the two ends of the sac. Here they divide again, but the nuclei of the lower end of the sac never give rise to antipodal cells. In fact, no antipodal cells are ever formed in this plant. The nuclei of the upper end of the sac give rise to the normal sexual apparatus in the usual way, so that we find here two synergidae and the egg-cell. The two nuclei of the lower end of the sac fuse and become the secondary nucleus of the embryo-sac which gives rise to the endosperm by its division. Pollen tubes lying in the upper part of the embryo-sac were very clearly observed, so that there is every reason to believe that fertilization takes place in this plant in a perfectly regular manner. *Garcinia Treubii* is dioecious, and only female plants grew in Buitenzorg. In spite of this a few of the flowers developed fruits and embryos. It might be concluded from this that these embryos develop apogamously or parthenogenetically, but, although this appears very likely, Treub points out that another explanation is not improbable. In some other dioecious Garcinias Pierre has occasionally found a flower which was hermaphrodite. Although Treub could not directly observe such flowers, he believes that it is not impossible that a hermaphrodite flower may here and there develop in *G. Treubii* among the many thousands of flowers produced, and thus explain the occasional appearance of fertile fruits in this plant. The early history of the embryo-sac of *G. Treubii* is similar to that of *G. Kydia*.—*R. B.*

Engelmann Spruce in the Rocky Mountains, with Special Reference to Growth, Volume, and Reproduction. By E. R. Hodson and J. H. Foster (*U.S.A. Dep. Agr. Forest Service, Circ.* 170). A comprehensive paper on the growth and management of Engelmann Spruce in the Rocky Mountains.

Though the timber is less valuable than that of the Douglas Fir, yet for ordinary purposes it is found useful, being close and straight-grained and easily worked. There are some useful tables on the volume of growth of this spruce, and short notes on insect pests and diseases.—*A. D. W.*

Enological Studies. By William B. Alwood (*U.S.A. Dep. Agr., Bur. Chem., Bull.* 140; May 1911).—It has been generally stated that

sucrose does not exist in grapes. The result of the experiments recorded in the first part of this bulletin proves that it does exist in varying quantities, according to the variety of grape. The second part of the bulletin gives descriptions of the chemical examinations made of a large number of varieties of grape, with careful tables of their sugar and acid content at different stages of their development.—*M. L. H.*

Enzymes, Catalase. By C. O. Appleman (*Bot. Gaz.* pp. 182-92; 1 fig.).—Catalase is best determined if the material (fresh potato extract) is ground with calcium carbonate and diluted with water at 20° C. Catalase effects the decomposition of hydrogen peroxide, but is itself consumed in the process.

The catalase activity is related to the respiratory activities in the potato decreasing under the same conditions as respiration.—*G. F. S. E.*

Erythronium, Development of Bulbs in. By F. H. Blodgett (*Bot. Gaz.* pp. 340-72, Nov. 1910; 3 plates, 7 figs.).—Describes fully the germinative, first and second vegetative periods, and the origin and development of the bulb. The description is very full and complete, but is not at all easy to abstract. The genus seems to have originated in Oregon (Pacific Slope), and has been distributed along lines approximately following the present habitats of the several species. During migration special methods for rapid descent into the soil were developed. The genus is apparently related to *Tulipa*.—*G. F. S. E.*

Eucalypts, Utilization of California. By H. S. Betts and C. Stowell Smith (*U.S.A. Dep. Agr., Forest Service, Circ.* 179).—The Eucalyptus has evidently found favour in California, where much capital has been invested in the planting of such species as have done best. Out of the seventy-five species that have been tried, only five give indications of being suitable in a commercial way for planting in California.

The tables dealing with the strength of the timber of various species are valuable, while the nicely executed illustration of the blue gum shows how well the tree succeeds in the new quarters to which it has been introduced.—*A. D. W.*

Eucalyptus Wood, The uses of (*Rev. Hort. de l'Algérie*, p. 47, Feb. 1911).—It is suggested that Algerian Eucalyptus may advantageously be used for cabinet-making. It is attractive in appearance and much less costly than mahogany. The wood of *Eucalyptus botryoides* is dark-red in colour, and *E. Trabuti* or *E. Rameliana* is pink.

To obtain the best results the trees should be sawn into planks as soon as felled and left to soak in water, preferably sea-water, for one or two years before using.—*M. L. H.*

Exoascus filicinus (Rostr.) Sacc., **A new host and station for.** By F. A. Wolf (*Mycologia*, ii. p. 247; 1910).—The occurrence in

America of the fungus *Exoascus filicinus* (*Taphrina filicina* Rostr.) is reported, its host being the fern *Dryopteris acrostichoides*, on the fronds of which it produces well-defined yellowish areas up to a centimetre wide. Hitherto the fungus had been reported only from Sweden, on *Polystichum spinulosum*.—*F. J. C.*

Farm Seeds, Testing in Home and Rural School. F. H. Hillman (*U.S.A. Dep. Agr., Farmers' Bull.* 428, p. 47, Feb. 1911; 32 figs.).—The author justifies the publication of the bulletin by a reference to the amount of adulteration carried on by some seed firms, and the need of an easy means of checking it.

The apparatus recommended consists of a stand magnifying-glass, a balance (particulars of a cheap and fairly easily home-made one are given), saucers and cloth for germination tests.

The author classifies impurities as follows: (*a*) inert matter; (*b*) harmless weed seeds; (*c*) noxious weed seeds. The rest of the bulletin gives general methods of testing, and also a few examples of tests of particular samples of seed.

Descriptions and diagrams (magnified and natural size) are given of various weed seeds.—*W. W.*

Fern-Cultures. By H. Fischer (*Beih. Bot. Cent.* Bd. 27, Abt. i. Heft 1, pp. 54-62; with 2 figs.).—The author sowed fern spores in water cultures, and found most suitable for the purpose Meyer's solution (1 per cent. K_2HPO_4, .03 per cent. $MgSO_4$, .01 per cent. $CaCl_2$, .01 per cent. NaCl, .001 per cent. Fe_2Cl_6), with an addition of .1 per cent. NH_4. NO_3. He found it possible to raise fern plants 3-4 cm. in height by this means, and could then plant them in peat or loam. He found that spores of *Polypodium vulgare* germinated in the dark, but points out that in no case has it been proved that darkness favours the germination of fern spores.—*G. F. S. E.*

Fern-prothallia, Distribution of Sex in. By D. M. Mottier (*Bot. Gaz.* pp. 209-213, Sept. 1910).—Spores of *Onoclea Struthiopteris* produce three kinds of prothallia, small with antheridia only, larger with archegonia only, and also others with both antheridia and archegonia. The author thinks it probable that the sexual tendency is determined in the spore, and is not due to conditions of nutrition.

G. F. S. E.

Ferns, Imbedded Sexual Cells in. By M. C. Ferguson (*Bot. Gaz.* pp. 443-8, June 1911; 2 plates).—Describes deep-seated antheridia and archegonia in *Pteris* sp.—*G. F. S. E.*

Fertilizers for Special Crops. By A. F. Woods and R. E. B. McKenney (*U.S.A. Dep. Agr., Year Book* 1902, pp. 553-73, reprint). This deals with the soils and manures most suitable for growing roses, violets, carnations, chrysanthemums, tomatos, and lettuce under glass. By using a mixture of coal ashes and peat it was found that

the vine and fruit of single-stem tomato plants can take up the following ingredients from each 100 square feet of trench: nitrogen, 168 grams, equal to nitrate of soda 2 lb. 5 oz.; phosphoric acid, 65 grams, equal to boneblack 13 oz.; and potash, 362 grams, equal to muriate of potash 1 lb. 9 oz. Of this amount nearly four-fifths went into the fruit (p. 567). The mere fact, however, that a plant will take up a certain amount of fertilizer is not in itself sufficient evidence that that amount of fertilizer is required (p. 568). Too much lime is said to produce excessive stem and leaf development and a diminished yield of fruit, while watery fruits are said to be richer in ash content than the more fleshy ones (p. 569). Soil sterilization is recommended for greenhouse work, and four methods of doing it on a commercial scale are described (pp. 555 and 573).—*A. P.*

Filmy Ferns in Jamaica. By F. Shreve (*Bot. Gaz.* March 1911; with 8 figs.).—The author first gives an interesting account of the distribution of the filmy ferns in Jamaica. They are most abundant at 1525 metres altitude. Some are confined to very moist conditions, whilst a few, mostly epiphytes, are able to endure almost as great a loss of water as mosses and ferns. The local distribution in the rain forests is determined by the differences in climate from the floor to the canopy. The author describes many experiments which show that almost all can meet loss of water from surface-dry leaves in a very moist atmosphere by root absorption. The transpiration current moves even when the leaves are wholly or partly surface-dry, but stops when the leaves are thoroughly wet. All, except the most drought-resisting forms, can exist as submerged aquatics. These xerophytic epiphytes can absorb atmospheric moisture in very moist air. The latter species have an intracellular or functional xerophily; the protoplasmic lining of the cells survives the replacing of the sap cavity by air, and even a considerable loss of water.—*G. F. S. E.*

Floats. By E. W. Gaither (*U.S.A. Exp. Stn., Ohio, Circ.* 105, Sept. 1910).—This is the commercial name for finely ground phosphate rock, a natural formation of tricalcium phosphate. It is usually of too low a grade to be used in the manufacture of acid phosphate, but it has been found that on clay and silt loam soils decaying organic matter and bacterial action render it sufficiently available to plants to make its use in connexion with farm and green manures both profitable and desirable. The material should contain not less than 26 per cent. phosphoric acid, and not more than 8 per cent. of oxides of iron and aluminium combined; while it should be sufficiently finely ground to enable not less than 93 per cent. of it to pass through an eighty-mesh sieve. The question of the relative availability of kiln-dried and sun-dried floats is still being investigated.—*A. P.*

Florida, Report on a Visit to. By H. A. Ballou, M.Sc. (*West Indian Bull.* vol. xi. No. 3, 1911).—This visit was made for the

purpose of noting the control of insect pests on citrus trees by means of natural enemies.

The *principal* pest of these trees is the orange white fly (there are others besides). It is most abundant, propagates rapidly, and lives on many non-citrus plants. It encourages the growth of black blight. The purple and other scales are also prevalent.

The principal enemies of the white fly are certain fungi, while scale insects are also attacked by enemies of the same class.

The most important of the former is the Red *Aschersonia.* This fungus in full possession of a tree badly infested with white fly is a most remarkable and conspicuous sight. The degree of control of the white fly by the fungi is surprising. On some trees 93 per cent. to 98 per cent. of the flies were killed, and in most groves the proportion was higher than 60 per cent.

The fungi achieve much under strictly natural conditions, but still more when these are supplemented by intelligent artificial measures, by which means also time is saved (six to eight weeks being sometimes gained). There are growers who make a business of supplying the spores of the fungi, and of applying them where required.—*C. H. L.*

Flower Colours. Miss M. Weaver (*U.S.A. Hort. Soc. Iowa*, xlv. p. 310, 1911).—Notes the infrequency of blue flowers in families where yellow, red, and magenta occur freely.—*A. A. K.*

Flowers in Winter in Algeria. By H. Gay (*Rev. Hort. de l'Algérie*, p. 116, April 1911).—An attractive list of the flowers which may be enjoyed on the Algerian coast during the winter months. The owner of a small garden at Surcouf gives a long list of blooms which may be gathered in January there, and as the result of recording the number of varieties which he observed in the course of each month during several years he gives the following as the average numbers: January, 21; February, 23; March, 29; April, 32; May, 36; June, 40; July, 35; August, 27; September, 17; October, 19; November, 19; December, 20.—*M. L. H.*

Forcing by Injection. By F. Weber (*Oestr. Gart. Zeit.* vol. vi. pt. vii. pp. 241-5; 2 figs.).—A new method of forcing plants consists in pushing a needle into the centre of the base of the bud; a better result may be obtained by injecting a small quantity of water at the temperature of the room into the bud at its base. Twigs of *Syringa vulgaris* treated in this way on December 15 began to open their leaves on December 26. Each leaf bud on a stem must be injected to bring the whole into growth.—*S. E. W.*

Forcing by Injection. By F. Jesenke (*Oestr. Gart. Zeit.* vol. vi. pt. viii. pp. 281-5; 3 plates).—The period of winter rest can be appreciably shortened by injecting water or aqueous solutions of alcohol or ether under a pressure of one to three atmospheres into the branches of shrubs. *Robinia Pseudacacia* gave the best results with a

5 per cent. alcohol and 0.1 per cent. ether solution. It burst into leaf twenty-six days earlier than the non-injected shoots. *Carpinus Betulus* gave similar results. *Populus canadensis* and *P. balsamifera* require a 10 per cent. alcohol solution. If the injections are to be of any value they must be made before the dormant period is over.

S. E. W.

Forcing Vegetables, &c., Thermosiphon for (*Rev. Hort. Belge*, p. 93, March 15, 1911; p. 113, April 1, 1911; p. 155, May 5, 1911; p. 190, June 15, 1911; figs.).—A series of articles written with the object of explaining the advantages of the thermosiphon, a simple type of hot-water apparatus for heating frames. The use of manure for this purpose has been proved to have many disadvantages, and the usual form of brick pit heated by pipes is both cumbrous and costly. This apparatus, which requires practically no mason work and is applicable to the usual wooden frames, is described and illustrations of two types suited to the use of market gardeners are given. In one type the pipes are arranged so as to be laid on the top of the soil merely, among the plants, until the temperature of the soil has reached the desired degree, when the pipes are withdrawn and, if required, moved to other frames. It is thus possible to heat a considerable number of frames with one portable apparatus, as after the first few days it will only be necessary to introduce the pipes every other day or even once in three days. Heating from below the soil requires, of course, more elaborate laying of the pipes, which in the case of perennial plants must be put in position before the plants are moved into the frame in autumn. In either case December 15 is given as the earliest date at which it is advisable to begin forcing perennial vegetables. Careful directions as to cultivation, degree of heat necessary, and general management are given for raising asparagus, sea-kale, chicory, lettuces, &c., for the early market.—*M. L. H.*

Forcing, Modern Methods of. By Curt. Reiter (*Rev. Hort. de l'Algérie*, p. 50, Feb. 1911).—This is an extract from the *Journal d'Horticulture Suisse*, and concerns the forcing of various plants in that climate so as to be ready by Christmas. The principal methods employed are:—

1. Warm-water treatment for lily of the valley, lilac, azalea, and most spring-flowering bulbs.

2. Etherization for lilac and generally all flowering shrubs.

3. The cultivation of all Dutch-grown flowering bulbs, and especially of hyacinths, Narcissus in Southern France for a year before forcing in the North.

In forcing lily of the valley the crowns should be plunged about November 27 in a basin of warm water at a temperature which is kept as regularly as possible at 35° Cent. for about fourteen or sixteen hours. They should afterwards be placed in drills in a temperature of 30° Cent. By December 15 the crowns may be removed to a greenhouse where the temperature is 15° to 18° Cent. After their

immersion the plants need not be forced in complete darkness; they will do quite well in semi-obscurity. If they are left longer in the bath than recommended above, or if the temperature of the water is higher, the growth of leaves will be unduly forced, to the detriment of the flowers, and no lesser temperature will be found sufficient. With lilac this treatment with warm water has also been found advantageous, and results in a better growth of leaf than is produced by etherization. The plants must be plunged head downwards in a bath deep enough to cover them up to the crown, and the water must be kept constantly at a temperature of from 35° to 40° Cent. for about ten hours. The plants must then be put in a dark place and forced in a temperature of from 35° to 40° Cent. When the flower-buds have attained half their size the lilacs must be removed into a light place to acquire their colour. In about fifteen days they may be placed in a cool house to harden off. About November 28 will be the date of soaking the plants if they are to be ready by Christmas, and the temperature of the water should be neither higher nor lower than that suggested. The same process may be applied to all plants in which the flower is formed in the bud as in the lilac, such as *Prunus triloba*, *Pyrus Scheideckeri*, *Wistaria*, *Viburnum Opulus*, *Cytisus Laburnum*, *Forsythia*, some Magnolias, &c.

Roses with this process require so much manipulation that it is not a method likely to spread among commercial growers, but the amateur with only a few plants to treat will find that it undoubtedly hastens the flowering period. The plants should be soaked for ten hours in water at a temperature of 15° Cent. 'Frau Karl Druschki' treated in this way showed well-formed buds when plants which had not been soaked were not nearly so forward. Lilac and other plants of the same sort may be treated by etherization. To accomplish this some receptacle which can be hermetically sealed up is necessary—a cement basin, a tin-lined case, &c. The plants should be laid in this in rows and covered with a lid in which is a small hole, which can be closed with a cork. Just below the hole in the box or other receptacle must be placed a small vessel for the ether. Cotton-wool may be placed in it to accelerate evaporation. Into this the ether is to be poured through the hole in the lid, which is quickly corked up again, and the plants left for forty-eight hours. They may then be removed and forced in the usual way. The process must not be carried on in the neighbourhood of fire as the ether is inflammable. A dose of 500 grammes to each cubic metre of air is enough for plants which are to flower at Christmas. It has been found almost impossible to get bulbs imported direct from Holland to flower in Switzerland by Christmas, but this difficulty is got over if the bulbs are grown for a year out of doors in a warm climate, such as that of the South of France.

M. L. H.

Forest Conditions in Ohio, Fourth Annual Report on (*U.S.A. Exp. Stn., Ohio, Bull.* 223, Nov. 1910).—The forest conditions in

Ohio are highly satisfactory, and evidently all work in connexion with timbered areas is carried out in the most sensible and up-to-date manner. The laws of Ohio relating to forestry are both comprehensive and well thought out, and must be a great aid to the successful carrying out of all woodland operations.—*A. D. W.*

Forest Nurseries for Schools. W. M. Moore and E. R. Jackson (*U.S.A. Dep. Agr., Farmers' Bull.* 423, p. 24; Dec. 1910; 8 plates, 1 tab.).—The bulletin suggests a variation for the usual school-garden type of work. The authors raise objections to the exclusive use of the school-garden for the raising of flowers and vegetables. One argument is that plants, &c., suitable for the school-garden arrive at their most interesting stages during the vacation.

Numerous hints on the site of the plantation, selection and storage of seeds, preparation of ground, testing seeds for vitality, planting, and transplanting are given. Interchange of seeds of one school district for seeds of another is recommended.

A table on p. 24 gives a summary of the treatment for twenty-eight trees.—*W. W.*

Forest Products, Insect Injuries to. By A. D. Hopkins (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 128; Dec. 1910).—Damage and loss from insect injuries to telephone and telegraph poles, posts, railroad ties, mine-props, and woodwork generally, can usually be prevented by the adoption of proper methods of management, or of treating the material with preservatives before and after it is utilized.

If possible, nothing but heart-wood should be used for the concealed parts in dwellings, outbuildings, bridges, &c., these parts being most liable to attack. If sapwood has to be used it should be treated with kerosene, coal-tar, creosote, or linseed oil.

Damage by white ants, or termites, can be often prevented by using only sound wood for underpinning foundations, and treating wood exposed to moist conditions with creosote, zinc-chloride, corrosive sublimate, &c.—*V. G. J.*

Forestry, Quarterly Journal of (vol. iv. pt. 4, vols. v. vi. pt. 1, Oct. 1910, Jan., April, July, Oct. 1911, and Jan. 1912).—Much information of a practical and useful kind is contained in these volumes.

"Forestry in Russia" is an able paper, from which we learn much regarding the vast forests of that country and their ever-increasing value to the State. How well the Evergreen Oak does in Norfolk will be learned from an article on this tree as growing at Holkham, where probably the finest specimens in this country are to be found. It is an excellent shelter and seaside tree, and should be extensively planted on exposed maritime situations.

The experiment with Scots Pine seed is both interesting and valuable, and all interested in forestry will look forward with interest to the carefully carried out experiments that are being conducted in

the North-east of Scotland under the superintendence of Brodie of Brodie.

The "Roadside Poplar in Belgium" is an interesting paper on a tree that is more or less neglected for afforesting purposes in this country. Much useful information as to how to treat the poplar for purely economic purposes and a summary of the best varieties to plant is a useful adjunct. We have often heard of the oak forests of Sclavonia, and Mr. Elwes' able paper on the subject affords pleasant reading to those who are acquainted with our oak woods at home.

One of the ablest and most valuable papers in vol. v. is that on the Sweet Chestnut as a timber tree, and we trust that the publication of this report will go far in establishing the tree as one of the most valuable from a purely economic point of view for planting in this country.

"Beech, Oak, and Hornbeam High Forests in France" is a paper of more than ordinary value, and should act as a stimulus to cultivators of similar woods in this country. The revenue and expenditure have been carefully worked out, and show that 14*s.* 10*d.* per acre has been returned for several years, even at the extremely low price of 4*d.* per cubic foot.

We are glad to see that the value of *Pinus insignis* as a timber-producing and shelter-giving tree has received the attention it deserves from Mr. B. W. Adkin. It may not be a suitable tree for general planting, but for maritime sites, in Southern England at least, has become firmly established.—*A. D. W.*

Forestry: Transactions of the Royal Scottish Arboricultural Society (vol. 24, pts. 1 and 2; 1911).—Much of part 1 is devoted to afforestation and forestry education, while papers on the Corsican Pine and Douglas Fir will be found well worthy of perusal, particularly as the timber of both trees is valuable as produced in this country.

The tables connected with the observations on the annual increment of spruce and Scots Pine are valuable, and show the increase in circumference of these trees during June and July.

"Planting for Shelter," by Sir Hugh Shaw-Stewart, Bart., is a valuable contribution to our knowledge of the trees that succeed best on exposed and high-lying situations. The larch, Scots Pine, and spruce amongst conifers, with the alder, birth, and sycamore as hardwoods are evidently the best suited for exposed mountain planting. There are many other interesting and valuable papers and short notes, all of which will be read with interest by the owners and managers of woodlands.—*A. D. W.*

Forests, Protection of from Fire. By Henry S. Graves (*U.S.A. Dep. Agr., Forest Service, Bull.* 82).—This interesting illustrated account of protection of forests from fires will appeal to the owners of plantations in this country, where large areas were burnt down during the past unusually hot and dry summer. In the chapter on methods of fighting surface fires the writer goes fully into the various ways by

which forest fires may be subdued, either with or without water, while the illustrations of beating out fires and the appliances used are well reproduced. Altogether this is a valuable contribution to the subject of which it treats.—*A. D. W.*

Forests, Some Insects injurious to. By A. D. Hopkins (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 58, pt. v.; Dec. 1909).—The principal insect enemies of Northern forests are described and their depredations estimated at an annual loss of $100,000,000. Methods of prevention and control are touched upon.—*F. J. C.*

Fowl Manure (*Jour. of Agr. Vict.*, p. 655; Sept. 1911).—The fresh manure contains: Water 56 per cent., organic matter 25 per cent., nitrogen 1 to 2 per cent., phosphoric acid 1.5 to 2 per cent., potash 0.8 to 0.9 per cent., lime 2 to 2.5 per cent., magnesia 0.75 per cent.; it contains all plant foods and is worth about 25*s.* per ton.—*C. H. H.*

Frost Fighting Studies in the Roque River Valley, Preliminary. By C. I. Lewis and F. R. Brown (*U.S.A. Exp. Stn., Oregon, Bull.* 110, Aug. 1911; 19 plates).—The local branch of the U.S. Weather Bureau, the telephone companies, and frost alarms are all used to warn fruit-growers when the temperature reaches the danger point. Two grades of oil were used in the experiments, and two types of heaters. At 30° F. outside temperature no increase was obtained in the temperature of the orchard when twenty heaters to the acre only were used, but with thirty-nine heaters to the acre an average increase of 1° was obtained, and with 100 to the acre $4\frac{1}{10}$° when the heaters were set 21 feet apart each way (p. 36). The average cost for each acre for a period of four hours was $5.10 for oil, not counting the equipment, and for wood under the same condition $ 5.40, as more labour was required. Under the conditions experienced this season there is considered to be no doubt that a crop can be saved by orchard heating (p. 62).

Observations lead the authors to doubt if an arbitrary table of temperatures for frost injury can be made, as the humidity of the air and the weather conditions generally seem to cause a very wide variation in the effect of the frosts (p. 60). The failure of 'Winter Nelis' pears to set was investigated without any conclusive results, though it was thought to be due to the kind of weather which prevailed during the flowering period (p. 59).—*A. P.*

Frost, Notes on. By E. B. Garriott, revised by A. G. McAdie (*U.S.A. Dep. Agr., Farmers' Bull.* 104, Dec. 1910; 4 figs.).—This gives the average dates of first killing frosts in autumn and last killing frosts in spring at Weather Bureau stations throughout the United States, with devices for preventing rapid radiation of heat from the soil and adding heat and moisture to the air with a view to protection from frost. See abstract under "Orchards" in the R.H.S. JOURNAL for November 1910 (vol. xxxvi., p. 505).—*A. P.*

Frosts, April. By R. Laubert (*Gartenflora*, vol. lx. pt. xiii. pp. 274-80).—Although exposure to a temperature of 20° F. for several days at the beginning of April had no lasting injurious effect on many shrubs and fruit trees, a frost in the third week in May caused heavy losses to fruit growers. It is suggested that orchards may be protected from late frosts by the use of a number of small heaters constructed to burn coal or petroleum.—*S. E. W.*

Fruit-bud Formation. By B. S. Pickett (*U.S.A. Exp. Stn., New Hamp., Bull.* 153; June 1911; figs.).—A plan of the experiment is given. It has been in progress three years, but the only definite conclusion so far arrived at is the benefit derived from cultivation of the soil, over growth in grass. While at the beginning of the experiment the latter appeared the better, after cultivation had been practised for a time the crops from trees in grass fell far behind those from the cultivated ground.—*F. J. C.*

Fruit, Co-operation in the Handling and Marketing of. By G. H. Powell (*U.S.A. Dep. Agr. Y. B.* 1910, p. 546).—This deals with the fundamental principles of co-operation and the different types of co-operative associations, with the causes of failure in some cases. The history and methods of the California Fruit-Growers' Exchange, the largest co-operative fruit-marketing organization in the United States, are dealt with in some detail.—*A. P.*

Fruit Flies, Part II. By W. B. Gurney (*Agr. Gaz. N.S.W.* vol. xxii. pt. viii. pp. 722-7; 5 figs.).—The Queensland Fruit fly (*Dacus tryoni*) attacks oranges, mandarins, peaches and nectarines, occasionally plums, apples, pears, lemons and loquats, also the following wild fruits:—White ash, Cheesewood (*Acronychia laevis*), Native Plum (*Sideroxylon australe*), and Wild Black Fig. The fruit-fly maggots are preyed on by a parasitic wasp (*Opius tryoni*). This wasp also destroys the Mediterranean Fly.—*S. E. W.*

Fruit Growing in Virginia (*Va. State Hort. Soc.* 1911).—Contains useful information for intending settlers in this State.—*A. P.*

Fruit, The Precooling of. By A. V. Stubenrauch and S. J. Dennis (*U.S.A. Dep. Agr., Year Book* 1910, p. 550; 5 plates).—The term "precooling" has been applied to the rapid and prompt cooling of fruit before it is shipped or stored, with the object of reducing its temperature as quickly as possible to a point where ripening will be retarded and decay and deterioration prevented. Many problems in this connexion remain to be solved, and the ideal system of precooling for all conditions has not yet been found. Investigations were begun in 1904, and the experimental work has so far included peaches, oranges, and table grapes. The difficulty of cooling fruit wrapped in paper and tightly packed in boxes was strikingly shown, and to do this after the fruit was loaded in the cars, when time was an important element and leakage considerable, required the use of

very large volumes of cold air; but in properly constructed storage rooms, with plant of moderate power, it was found that thirty-six to forty-eight hours, depending upon the initial temperature of the fruit and the efficiency and capacity of the refrigerating apparatus, were required to cool the fruit to the temperature which would be maintained by the iced cars *en route*. It has been demonstrated that it is possible to transport fruit safely which has been well ripened on the tree and preserve its quality and flavour, thus obviating the necessity of picking such fruit as peaches, plums, and apricots in a hard, green condition.

Commercially, two types of precooling are now in use. In one the cooling is accomplished before the fruit is loaded in the cars, and in the other after it has been loaded, by forcing cold air through the cars. The temperature of the air surrounding the fruit package does not indicate at all the temperature of the fruit itself unless it has been exposed to the air temperature for many hours. The blowing of cold air over fruit has very little or no effect in preserving it unless continued until the temperature of the fruit itself is actually lowered.—*A. P.*

Fruit Trees, Chlorosis in. By G. Rivière and C. Bailhache (*Jour. Soc. Nat. Hort. Fr.* p. 649; Dec. 1911.).—The results of some experiments in treating trees affected with chlorosis with iron. Most investigators so far have used powdered protosulphate of iron. The writers of this article seem to have proved that a far more efficacious treatment is with citro-ammoniacal pyrophosphate of iron used in solution. In other cases growers have generally found it necessary to treat each affected limb; these writers found that with their mixture injection through one hole was enough for the whole tree-system above it. In the case of a U-shaped cordon a treatment of one branch of the U near its junction with the trunk was quite efficacious on the other branch. The mixture has the additional advantage that it is not precipitated by tannin. The strength of the mixture should be at the rate of 0gr.50 to the litre of water. The glass tube through which the iron was administered is described and the length of time it took the trees to absorb the necessary dose is given.—*M. L. H.*

Fruit Trees, Effect of Grass on. By the Duke of Bedford, K.G., and Spencer U. Pickering, F.R.S. (*Woburn, Thirteenth Report*, 1911; 5 plates).—What the authors term "grass-effect" takes the form of the arrest of all healthy growth, a light and unhealthy character imparted to the leaves, and the earliness of the appearance of autumn tints (p. 9), resulting in some cases in the early death of the trees. During the sixteen years over which the experiments have extended no recovery from the effect has been noticed except where the roots have begun to extend beyond the grassed area. Trees which become grassed over gradually, however, during the course of several years, apparently accommodate themselves to the altering conditions, and suffer much less than when grass is actually

sown over their roots, as was the case in most of the experiments. This fact, as well as the varying intensity of the effect of grass in different soils and the greater or less susceptibility of certain varieties, account for the effect of grass in commercial and farmhouse orchards being generally less than that observed in the experimental plots (p. 3). Practical experience derived in planting annually some 400 or 500 trees in the orchards of farm tenants in Devonshire leads the authors to the unhesitating conclusion that the most essential item for the welfare of orchard trees is the keeping of the grass away from their roots (p. 4). Cases in which trees have not suffered to some extent from being grassed over are rare, some trees at the farm which were grassed over twelve years after planting beginning to suffer severely the third or fourth season after planting (p. 19).

No explanation of the difference in the grass-effect in different soils can be traced to the depth of good soil available for root development, and little difference is shown in its effects, whether the trees are on surface- or deep-rooting stocks (p. 8). In certain soils which are favourable to the practice the effect of grassing to within five or six feet of the stems may result in heavier cropping and increased colour in the fruit, and such results have been obtained at Ridgmont. The practice cannot be generally recommended, however, except experimentally, owing to the differences in soils (p. 11). The action of the grass upon the well-being of the trees is felt as soon as ever any of the tree roots come into the grassed area, and recovery begins as soon as any of the roots get beyond, or even near, the limits of the same, examination in one case where grass-effect was apparent showing that the proportion of roots extending into the grassed soil was only $\frac{1}{2000}$th part of the weight of the whole tree (p. 12). Forest trees appear to be affected by grass in the same way as fruit trees, though in the case of conifers planted in light soil the effect was much less than with other trees, and recovery occurred as time went on instead of the effect becoming intensified (pp. 41-4).

Experiments were conducted with eighteen different grasses, the action of all of which was considerable, the effect produced in each case being proportionate to the strength of the grasses. Clovers had a similar effect, but the lightness in the colour of the leaves was absent (pp. 45-51).

Further investigations strengthened the conclusions that grass-effect was not explainable by its affecting the aeration or temperature of the soil, or altering the content of carbonic acid, moisture (pp. 52-68), or food (pp. 69-81). Trees in tilled soil did not exhibit the grass-effect in dry seasons, and it seems to be practically independent of rainfall. As grass crops, if properly manured, actually enrich the soil, and trees grown in soil taken from the grass plots flourished better than in soil taken from the tilled plots, if grass-effect is due to starvation it is in a land of plenty. Experiments begun in 1909 seem to definitely prove that the results of cutting and grazing the grass are identical, at least in the case of freshly

planted trees (p. 27). The physical alteration of the soil as a possible cause of the action of grass has been examined, but with negative results (pp. 106-122).

The question of soil bacteria was also partially examined (p. 123), and the conclusion arrived at that neither the mere number of soil bacteria, nor the absence of those of a beneficial character, could explain the grass-effect; while the absence of any ill effect from grass leachings, or from soil taken from grassed ground, militates against the theory that it may be due to the presence of maleficent bacteria.

Trees were grown in soil partially sterilized by heating, and they were found to behave in the same way as other plants, being later in starting into growth but growing better afterwards (p. 124). The destruction of the greater part of the bacteria and the whole of certain protozoa which feed upon them results in the unchecked multiplication of the bacteria after a time, so that the soil becomes richer in bacteria and in the nitrates formed by them. This alone does not explain the delayed germination of seeds in soil which has been heated (pp. 127-30). The heating also results in the production of some substance which is actively toxic to plant growth, and plants will not flourish, or seeds even germinate, in a soil while it is present in sufficient quantity. The toxin is rapidly oxidized by the action of air and moisture and is destroyed under cultivation in a few weeks, after which plants grow better in it than in soil which has not been heated. Thus plants may behave in diametrically opposite ways in soils which have been heated according to the conditions under which they are grown (p. 126). It was observed that the soil also from grassed ground was more favourable to the germination of seeds than that from tilled ground. Another point of resemblance was that soils which had been heated were less readily wetted with water than unheated soils, the water standing on them as if they were oiled, and the same difficulty in wetting was conspicuous in several cases of the soil from grassed land as compared with that from tilled (p. 141). It was found that pot-grown trees, when watered with the leachings obtained from trays containing grass growing in sand, flourished more than when water alone was supplied (p. 87); but when the trays, which were made specially to fit the pots, were placed on the surface of the soil in such a way that the separation of the medium in which the grass was growing from that in which the trees were growing was almost, if not quite, complete, and the leachings from the grass reached the tree roots with practically no exposure to the air (p. 150), they had a very deleterious effect (except in the case of the trees growing in sand), nearly as great as when the grass was growing above the roots in the ordinary way (p. 94).

All these observations point to the conclusion that a toxic substance is formed by the grass which is readily oxidizable into some substance which favours plant growth, the injurious effect upon trees being due to the fact that the toxic substance is brought into contact with the roots before it can be oxidized (p. 151). The most weighty evidence on

the whole question is perhaps the negative evidence, depending on the exclusion of all the other explanations which it appears possible to suggest (p. 142).—*A. P.*

Fruit Trees, Manuring. By A. Heyst (*Gartenflora*, vol. lx. pt. xxii. pp. 501-2).—In the case of fruit for exhibition, remove the soil on the surface and replace it by a good compost, making a circular ridge at some distance from the tree to facilitate watering. Basic slag and kainit may be added to the compost with advantage. The operation should be carried out in autumn.—*S. E. W.*

Fruit Trees, Propagation of. By C. F. Cole (*Jour. of Agr. Vict.* for July, Aug., Sept., Oct., Nov., and Dec.).—Subject well treated and well illustrated.—*C. H. H.*

Fruit Trees, Protection of (*Oestr. Gart. Zeit.* vol. vi. pt. xii. pp. 463-4).—Carbolineum is recommended for spraying fruit trees. As there are many varieties of carbolineum on the market, great caution is required in using it. The soluble form mixed with double the quantity of water may be used for spraying in autumn or winter.
S. E. W.

Fruit Trees, Worn out Varieties of. By J. von Jablanczy (*Oestr. Gard. Zeit.* vol. vi. pt. x. pp. 368-72, and pt. xi. pp. 419-26). Complaints that certain sorts of fruit trees are worn out are shown on investigation to arise from the neglect of proper cultivation and from the impoverishment of the soil.—*S. E. W.*

Fumigation Investigations in California. By R. S. Woglum (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 79; June 1909).—An account of a simplified method of fumigating citrus-trees growing in the open with hydrocyanic acid gas. The insects specially aimed at were the scale insects. It is to be noted that damage usually followed upon young fruits and tender growths when the fumigation was sufficiently strong to kill the scale insects.—*F. J. C.*

Fumigation with Hydrocyanic-acid Gas, Chemistry of. By C. C. McDonnell (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 90, pt. iii.). It is shown that the presence of chlorides and nitrates in cyanides causes a marked decomposition of the hydrocyanic acid gas when liberated, the effect of the former being more intense than the latter. An analysis should not only show the percentage of cyanide present but of nitrate and chloride as well. These points are of practical importance to those using fumigation with hydrocyanic acid, since the amount safe to use and still sufficient to kill pests lies between narrow limits.—*F. J. C.*

Fungi, Distribution of the (*Beih. Bot. Cent.*, Bd. 27, Abt. ii. Heft 3, pp. 359-74).—F. Theissen, S.J., Innsbruck, gives an interesting sketch of the problems involved in the plant distribution of the fungi

as well as a special study of the Xylariae of Brazil. The habitats of the various species are given, and he concludes that about 50 per cent. are either tropical or chiefly tropical, 26 per cent. are confined to the tropics of America, and 24 per cent. are isolated (endemic?) species.

G. F. S. E.

Fungi, Nature of Parasitic. By H. T. Güssow (*Gard. Chron.* 1912, March 23, p. 183; March 30, p. 198; April 6, p. 215).—A concise outline of the life history, spore production, need for recognizing the winter as well as summer forms, effect on host plant, factors rendering certain plants more or less immune, and suggestions for preventive measures.—*E. A. B.*

Fungi of Chile, Parasitic. By P. Thaxter (*Bot. Gaz.* pp. 430-42, Dec. 1910; 2 plates and 1 fig.).—A new species of *Taphrina* and two new species of *Uncinula* which he obtained on leaves of the Antarctic beech near Punta Arenas are described.—*G. F. S. E.*

Fungous Diseases of Plants, Notes on. L. H. Pammell (*U.S.A. Hort. Soc. Iowa*, xlv. p. 229).—In the course of this paper Mr. Pammell says: "The old subject of fire blight of pears, apples, quinces, &c., receives treatment from Whetzel and Stewart. This paper is well illustrated with figures showing the claw from a bee's foot, with blight bacteria on and about it to show the relative size. Then the authors give an account of the injury done to branches, fruit, blooms, and trunks of trees, &c. The bulletin emphasizes the importance of insects of various kinds in transmitting the disease. The authors recommend the following treatment to destroy all sources of infection—that is, clean out all cankers in the apples, pears, and quinces, cutting well into the healthy tissue, and removing the diseased bark; disinfect the cut with corrosive sublimate solution, one to 1000 of water; make a regular inspection of every tree in the orchard at least once a year during the growing season. Break out all blossom spurs that show the disease, and remove them from the orchard; remove all water sprouts from the trunks of trees; cut out all blighted twigs." Infection may be caused by (*a*) blossom inoculation; (*b*) twig inoculation. Insects are the principal means of infection for the first. Twig inoculation may be brought about in various ways.

"Every horticulturist is more or less familiar with the aphis and its injuries to trees. The aphis is a sucking insect. It obtains its food by puncturing the tender bark of young shoots and leaves with its proboscis, through which it sucks the plant juice. It reproduces very rapidly. Hitherto it has been thought that the extent of the damage which it caused was confined to the direct injury done to the plant by depriving it of sap, and the malformations caused by the irritation set up in the area attacked. Our observations this season, however, have proven conclusively that the great majority of the new infections of twigs by the blight after the blossom season has

closed are due to the transmission of the germ from diseased areas by aphides. From our observations we have concluded that practically all the fresh nursery infection, all the water-sprout infection, all the sucker infection, all the twig infection other than that due to blossom inoculation, on the apple trees was due this season to inoculation by the aphis, and we infer from this that probably it is usually so. This season the aphis was very plentiful, and the blight was proportionally so. Possibly the periodic bad outbreaks of blight in the apple are coincident with a plague of aphides such as occurred this year."

A. A. K.

Galanthus Elwesii poculiformis. A new variety. By R. Farrer (*Gard. Chron.* p. 33; Jan. 20, 1912).—A robust variety in which the inner segments are two-thirds of the length of the outer, and purely white externally, and without the apical sinus; internally marked with six short green lines at the base.—*E. A. B.*

Gardeners, Injuries to, from Plants. By H. de Varigny (*Rev. Hort. Belge*, p. 95, March 15, 1911; and p. 123, April 15, 1911).—These two articles collect the evidence against certain trees and shrubs as capable of causing more or less severe injury either by direct poisoning or by inflicting poisoned wounds. The first article deals with cases of local poisoning due to wounds from rose and blackthorn, and gives several theories to account for such poisoning. Rose-pricks have been shown to be more harmful in wet years, when mildew is most prevalent on the trees, and some growers assert that most cases of poisoning occur when the men have been at work on trees infested with mildew. Several cases have been investigated in which a fungus was found to be present in the eruption caused by rose-wounds, so that it is probable that the evil effects of the pricks are due to inoculation with a fungus. Two other theories on the subject are, first, that it is the manure-water with which the roses are watered which does the mischief; and secondly, that the blackthorn has been rendered septic by its thorns having been used as a larder for the putrefying stores of the shrike.

In general, all spinous plants may be charged with septic matter, and may set up local infection. Even more serious results are traced to the action of other plants. The common nettle is said to have been the death of dogs in many cases by affecting their throats while the animals were licking their stung limbs and so causing congestion and asphyxia. The toxic qualities of several Primulas are well known and some fatal cases are here cited.

Rhus Toxicodendron is hardly cultivated at all abroad on account of its dangerous character; many plants possess an irritating juice, such as some species of Eucalyptus, Solanum, Hellebore, Clematis, &c. The wild form of the last is sometimes used by tramps to produce or keep up ulcerations. Even asparagus, hops, and the down of peaches sometimes produce irritation, and the daffodil pickers of the Scilly

Islands suffer from an affection of the hands at "bunching" time, the nature of which has not yet been satisfactorily ascertained.

M. L. H.

Gardeners, Mortality of. By F. Kanngiesser (*Gartenflora*, vol. lx. pt. xv. 329-31).—A three years' average shows that the deaths of gardeners in Germany are due to the following causes:—

Tuberculosis .	36·3 per cent.	Apoplexy . .	3·6 per cent.
Heart diseases .	12 " "	Kidney diseases .	3·6 " "
Nervous diseases .	4·3 " "	Stomach diseases .	3·6 " "
Suicide . .	4·3 " "	Appendicitis . .	3·2 " "
Accidents . .	4·3 " "	Cancer . . .	2 " "
Liver . . .	4 " "	Diabetes . .	1·7 " "

S. E. W.

Gipsy and Brown-Tail Moths through Imported Nursery Stock, Danger of General Spread of the. By C. L. Marlatt (*U.S.A. Dep. Agr., Farm. Bull.* 453; April 1911; 7 figs.).—This paper gives a record of the infested importation during the last two years and descriptions of nursery conditions in Europe, showing the nature of the infestation there, and concludes with a brief description, with illustrations, of the two moth pests which are now being imported.—*V. G. J.*

Gladiolus, A new 'Glory' (*Rev. Hort.* p. 414; Sept. 16, 1911). Described as the commencement of a new race raised in the United States, and exhibited in France by MM. Cayeux and Le Clerc. The flowers are large, open, with broad, beautifully undulate petals, creamy-rose, with a crimson central spot. Very vigorous, reaching a height of over four feet. Spike of 8 to 15 flowers.—*C. T. D.*

Gladiolus Gandavensis 'Schwaben.' By P. Schmidt (*Oestr. Gart. Zeit.* vol. vi. pt. xii. pp. 464-6; 1 plate).—This new Gladiolus bears twenty yellow flowers on a stem.—*S. E. W.*

Gramineae, Systematic Description of. By Ernst H. L. Krause (*Beih. Bot. Cent.* Bd. 27, Abt. ii. Heft 3, pp. 412-24).—Notes on the correct systematic position of thirty-two genera of grasses.

G. F. S. E.

Grape Insects, A Preliminary Report on. By Frederick Z. Hartzell (*U.S.A. Exp. Sta., New York, Bull.* 331; Dec. 1910; 15 plates, 7 figs.).—This is a report of the studies on the grape flea-beetle, the grape-blossom midge, the rose-chafer, the grape root-worm, and the grape leaf-hopper.—*V. G. J.*

Green-houses, Painting interior of (*Oestr. Gart. Zeit.* vol. vi. pt. xii. pp. 452-5).—The durability of the paint used for the interior of a green-house is increased by the addition of paraffin wax dissolved in hot turpentine or petroleum.—*S. E. W.*

Ground Nuts, Diseases of. By F. W. South (*West Indian Bull.* vol. xi. No. 3, 1911).—Three diseases of ground nuts have been reported from the West Indian islands:

1. A rust fungus attacks leaves; amount of damage varies.

2. A leaf spot attacks leaves; damage unimportant.

3. A root disease (unidentified) occurs in Barbados, Granada, Dominica, St. Kitts, and Nevis. Its host plants are numerous, and of a very general nature. It is an important fungus, difficult to control.—*C. H. L.*

Ground Nuts in West Indies, Notes on (*West Indian Bull.* vol. xi. No. 3, 1911).

1. The disinfection of nuts by immersion for five minutes in a solution of corrosive sublimate (1 in 1000) before planting is recommended.

2. The most suitable varieties are the Spanish and Carolina running varieties.

3. An application of 1200 to 2400 lb. of lime to the acre is advantageous, especially in Dominica, Montserrat, and Nevis.

4. Gradual acclimatization may reduce the harm caused by fungi, and with seed selection increase the yield of different varieties.

5. The extended cultivation of ground nuts will prove a useful addition to the agriculture of the islands.—*C. H. L.*

Hazelnuts. By E. Gross (*Oestr. Gart. Zeit.* vol. vi. pt. xii. pp. 441-2).—The most profitable nuts for market are 'Lambert,' 'Merveille de Bollweiler,' 'Princess Royal,' and the English cob.

S. E. W.

Heliotrope, 'Mathilde Crémieux' (*Rev. Hort.* p. 515; Nov. 16, 1911).—Highly recommended as a very beautiful variety, resisting both prolonged drought and persistent humid conditions, as exemplified by the dry and wet summers of 1911 and 1910. Raised by M. Bruant.—*C. T. D.*

Heredity, Alteration through Ovarial Treatment. By D. T. MacDougal (*Bot. Gaz.* pp. 241-57, April 1911; 3 plates, 3 figs.).—The author has found that distinct differences in seedlings may be produced by injecting various substances (zinc sulphate, sugar solution, methyl blue, &c.) into ovaries when this is done about twenty-four hours before fertilization. *Rehmannia* seedlings became annuals and were quite glabrous. *Oenothera biennis* (zinc solution) showed marked reaction to this treatment. The differences are given in full. Both the original and the derivative have distinctly changed when removed to different localities. The derivative has wider leaves and is more able to endure a mountain climate than the parent. It also has more red in the leaves.

Hybrids of derivatives with the parent are intermediate in character.

There is also in the paper an interesting description of the conse-

quences of introducing methyl-blue into the ovaries of *Carnegiea* and of *Oenothera*.—*G. F. S. E.*

Honey, Production and Care of Extracted. By E. F. Phillips, C. A. Browne, and G. F. White (*U.S.A. Dep. Agr., Bur. of Ent., Bull.* 75, parts i. iii. iv., 1907-1908).—A body of information for the scientific bee-keeper.—*M. L. H.*

Hyacinth, Tetramerous flowers of. By H. Fischer (*Beih. Bot. Cent.* Bd. 27, Abt. i. Heft 1, pp. 52, 53).—The author found the two lowest flowers of a white hyacinth bloom to be tetramerous. He found the number of perianth segments to be less in the flowers higher up, the inflorescence diminishing from 8 to 7 and finally 6. He found in cases of peloria the number of spurs to be always greatest towards the base of the inflorescence, and he is inclined to attribute the abnormality in both cases to an excess of nourishment.

He considers light favours carbon-assimilation, which favours flower formation, and refers to Klebs' discovery of the relation between sugar contents and abundance of flowers.—*G. F. S. E.*

Impatiens Herzogii (*Bot. Mag.* t. 8396).—German New Guinea. Family, Balsaminaceae. Herb, glabrous. Leaves, $2\frac{1}{2}$-$5\frac{1}{2}$ inches long. Inflorescence, simply pedicelled. Flowers, showy, $1\frac{1}{2}$-$2\frac{1}{4}$ inches across, scarlet.—*G. H.*

Insect Pests, Destruction of. By U. Dammer (*Gartenflora*, vol. lx. pt. xxii. pp. 501-3).—Thripsoline, a German preparation, is recommended as an efficient insecticide.—*S. E. W.*

Insects and Diseases affecting Horticultural Crops, The Control of. By H. R. Fulton, W. J. Wright, and J. W. Gregg (*U.S.A. Exp. Sta., Penn., Bull.* 110; April 1911).—This bulletin contains descriptions of the principal insect enemies and fungoid diseases of fruit and vegetables, with formulae of sprays and washes.—*V. G. J.*

Ionopsidium acaule. By Ad. van den Heede (*Rev. Hort. Belge*, p. 185, June 15, 1911).—A plea for the more extended culture of this plant which is enthusiastically described, and which is said to make a charming companion to *Spergula pilifera* or *Sagina subulata*. One peculiarity of *Ionopsidium* is the wonderful rapidity of its growth. Eight or ten weeks after it is sown the plant will be in flower, and it remains so for several months. Successional sowings would keep up a continuous supply of this pink or white flower with its delicate scent. It should be raised in boxes and pricked out, and it might be raised in pots in quantities for market purposes, as musk used to be at one time.—*M. L. H.*

Iris tenuissima, sp. nov. By W. R. Dykes (*Gard. Chron.* p. 18, Jan. 13, 1912).—Description and Latin diagnosis of a Californian Iris approaching *Iris Purdyi*.—*E. A. B.*

Irrigation in Colorado. By C. W. Beach and P. J. Preston (*U.S.A. Dep. Agr., Off. Exp. Stns., Bull.* 218, July 1910; map).—In this State there are still nearly twenty-five million acres unappropriated and unreserved, much of which is open to entry under the land laws. About two million acres are irrigated, and nearly another million could be irrigated from existing canals. It is held that in farming by irrigation the best returns are to be secured by the individual effort of the small farmer, and the tendency is towards smaller farms and more intense cultivation (p. 7). This bulletin gives much detailed information as to the water resources of the State—the amount of water escaping from the streams each year, with the storage capacity of reservoirs, return seepage, and areas irrigated, along some of the principal rivers (pp. 14-22). The rise and progress of irrigation is traced to explain the development of modern administrative methods (pp. 23-28), and the present state of the law as regards acquirement of water rights &c. (pp. 35 and 36). Estimates are given of the cost of raising various crops, and the equipment and capital required to establish a forty-acre irrigated fruit farm (pp. 40-48). See Abstract on "Irrigation Problems," R.H.S. JOURNAL for December 1911 (vol. xxxvii. p. 464).—*A. P.*

Ivory Palm (*Gartenflora*, vol. lx. pt. xvi. pp. 365-7; 1 plate).—*Phytelephas macrocarpa*, the ivory palm, is a native of South America. It attains a height of 6 feet and is dioecious. The staminate flowers are arranged in thousands on a long, thick, root-like stem; the pistillate flowers are few in number. Vegetable ivory is obtained from the fruit. These palms are scarcely worth growing under glass.—*S. E. W.*

Kainit: its Physical Action on Soil. By Alfred J. Ewart (*Jour. Agr. Vict.* p. 738; Nov. 1911).—Kainit, when applied to the soil in large amounts, increases the conductive power of the soil for heat, and hence keeps its temperature more uniform. Exactly how it acts is not quite certain, but the application of kainit at the rate of 100 or 300 lb. to the acre was found in Germany to reduce the amount of frost. When applied in greater amounts it forms a crust on the surface of the soil and appears to render it liable to a greater variation of temperature than before any was applied. These facts are of interest because they show how complicated may be the action of any manurial substance when applied to the soil.—*C. H. H.*

Laburnum Adami, A Periclinal Chimaera. By Nienburg (*Gartenflora*, vol. lx. pt. xvii. pp. 369-71).—Buder has found additional proof that *Laburnum Adami* is a periclinal chimaera. The cells of *Cytisus purpureus* contain tannic acid; the cells of *Laburnum vulgare* do not. When a section of the leaf-stalk of *Adami* is treated with potassium dichromate, the presence of the two kind of cells is clearly seen under the microscope.—*S. E. W.*

Landolphia Petersiana (*Bot. Mag.* t. 8389).—East Africa. Family, Apocynaceae; tribe, Plumerioideae. Shrub, climbing by

means of the inflorescence. Leaves, 3-4½ inches long. Corolla, white, fragrant, ⅝-1 inch long.—*G. H.*

Land Settlement Scheme in St. Vincent, An Account of the Working of the. By W. N. Sands (*West Indian Bull.* vol. xi. No. 3, 1911).—This scheme arose from the sitting of a Royal Commission in 1897, which reported that owing to Crown lands in St. Vincent being unsuitable, it might be necessary to expropriate certain lands round the sea-coast, and settle proprietary cultivators on them, the cost to be borne by the Imperial Government.

This unsatisfactory state of affairs was intensified by a disastrous hurricane in September 1898.

In 1899 several estates were acquired and split up into small holdings averaging 5 acres each.

A grant-in-aid of £15,000 was made, and the actual cost of acquisition was £14,706.

Difficulties and dissatisfaction at the outset were finally overcome, and financially the scheme has been a success; only a few of the holdings had to be forfeited for want of care and attention.

The Agricultural Department distributed free of cost many thousands of useful plants and seeds. To complete the scheme it would be well to start co-operative disposal of the produce, and also credit banks on the Raiffeisen system.

The principal crops grown were cotton, arrowroot, cassava, cacao, Indian corn, sugar-cane, plantains, bananas, &c.—*C. H. L.*

Lands (Alluvial) of the Lower Mississippi Valley and their Drainage. By A. E. Morgan (*U.S.A. Dep. Agr., Off. Exp. Stns., Ann. Rept.* 1908; 6 figs.).—Ten to fifteen million acres of fertile and easily tilled soils are awaiting drainage. Before the construction of levees nearly all the streams in the alluvial regions were subject to frequent overflows, and on the bottom lands along the Arkansas River the writer has seen an inch of alluvium deposited over the surface of the inundated land as the result of a single overflow of a few weeks' duration. During the last fifty years there has been great progress in levee construction, and there is now an efficient system extending almost the entire distance from near the south line of Missouri to the Gulf. The larger part of the land which can be cultivated without drainage is now in use, and it is estimated that during the next few years fifty or a hundred million dollars will be spent on drainage, as upon this, and protection from overflow, the future agricultural development of the region is dependent. The excavation of all but the smallest ditches is usually accomplished by the floating steam dredge, and work which in olden times took months to perform can now be accomplished in as many weeks.—*A. P.*

Leaves of Laburnum, a Biometrical study of the. By Paul Vogler (St. Gallen) (*Beih. Bot. Cent.* Bd. 27, Abt. i. Heft 3, pp. 391-437; with 12 figs.).—The author measured lengths, breadths

and the ratio of length to breadth in 1000 terminal leaflets and 1000 lateral leaflets of three different plants of Laburnum. His results being of some interest, he tested his conclusions with measurements of these three factors upon nineteen others, and from the same plant in different years. He finds evidence of heterophylly in *Cytisus Laburnum*. There is a strong positive correlation between the length and breadth of the leaflet. Longer leaflets are relatively smaller than shorter ones. The terminal leaflets are longer than the lateral ones, but narrower. The difference in length is more pronounced the longer the end leaflet may be, and the difference in breadth less pronounced in cases of very broad side leaflets.

All these characters differ in different years, so that though two stocks may diverge widely, they need not bring about genotypic difference. No varieties based on these characters can be distinguished, as there are transitions without marked gaps. The length of the terminal leaflet seems to depend on habitat. Specially sunny habitats produce longer leaflets. He finds no support for the Ritter Ludwig theory, as no special maxima on Fibonacci figures or their derivatives could be discovered.—*G. F. S. E.*

Leguminosae, Style and Stigma in. By C. Mönch (*Beih. Bot. Cent.* Bd. 27, Abt. i. Heft 1, pp. 83-126; with 12 figs.).—Describes and figures the style and stigma in the chief tribes of this order. These show great variety and may be characteristic of species and genera, but not of higher groups. The stigma is (in Papilionaceae and several Caesalpiniae) easily rubbed off and disorganized, changing into lumps of some oily material. This enables the pollen grain to reach the cell-sap of the stigmatic tissue. Many self-sterile Leguminosae can be self-pollinated when the stigma is rubbed. Similar stigmas occur in Crassulaceae, *Polygala*, *Corydalis*, *Atropa*, and *Rhododendron*, but not in Mimosaceae, Rosaceae, and Saxifragaceae.

The oily matter makes (in these last-named forms) the stigmatic surface sticky so that the pollen grains are held on to the stigmatic surface.—*G. F. S. E.*

Lens-cells in the Epidermis of Mesembryanthemum pseudotruncatellum. By F. Summers (*Ann. Bot.* xxv. pp. 1137-45; Oct. 1911).—This peculiar species from the Cape belongs to the section *Sphaeroidea*, where two similarly shaped leaves roughly sphaeroidal in form compose practically the whole aerial part of the plant. The plants resemble the stones of the Karroo amongst which they grow. The structure is described in detail, and it is shown that well-developed lens-cells are present, but they do not function as organs of perception for the direction of the incident light rays, neither have they any connexion with heliotropic phenomena. They are stated to be quite efficient in structure, but their function is almost wholly shut out by the encrustation of calcium oxalate found in the epidermis. As the plant in its native habitat is subject to strong solar illumination, the encrustation is a protection when this becomes too strong.

At the same time the combination of encrustation and lens-cells is regarded as distinctly advantageous. An encrustation of uniform thickness and colour would be better protection against insolation, but in that case the interior of the plant would not be illuminated at all. With the development of the papilla, a small fraction of the upper surface of each epidermal cell is available for the collection of light rays, whilst the remainder is under a protective cover. The protection is extended to the papillae, which are covered with a fine incrustation, but as a compensation, are more highly developed as light ray collectors.—*A. D. C.*

Leonotis dysophylla (*Bot. Mag.* t. 8404).—S. Africa. Family, Labiatae; tribe, Stachydeae. Herb, 2-3 feet high. Leaves, ovate-lanceolate, tapering below, 3-3½ inches long. Whorls solitary or two superposed. Corolla, orange 1-1½ inches long.—*G. H.*

Lilies and Sunshine. By A. Grove (*Gard. Chron.* p. 131, March 2, 1912).—A review of the behaviour of Lilies in cultivation during the hot, dry summer of 1911.—*E. A. B.*

Lilium myriophyllum. By A. Grove (*Gard. Chron.* p. 272; April 27; with 2 figs.).—Points out differences in bulb and flower between the plants distributed by Leichtlin and those collected later by Wilson under this name.—*E. A. B.*

Lime Sulphur as a Fungicide (*U.S.A. Dep. Agr., Farmers' Bull.* 435, pp. 12-15; March 1911).—The use of some kind of lime-sulphur as a substitute for Bordeaux mixture in combating fungus diseases of the orchard is at the present time of great interest to fruit-growers. Bordeaux mixture is the standard fungicide, but on certain varieties of trees and under certain weather conditions this causes damage to the foliage and often russets the fruit, especially when used during the summer. Consequently there is a demand for a spray that can be used on the foliage of these more sensitive trees without injury, and yet control the prevalent and injurious fungus diseases to which they are subject.

The self-boiled lime-sulphur mixture of Scott, which was developed primarily for spraying peach-trees, is the spray commonly meant when speaking of the self-boiled lime-sulphur preparations. It is made by using eight pounds of fresh stone-lime and eight pounds of sulphur—either flowers or flour of sulphur—to fifty gallons of water, commonly designated as an 8 : 8 : 50 mixture, or the strength may vary from 6 : 6 : 50 to 10 : 10 : 50, governed by the time of year it is to be applied, the kind of fruit-trees to be sprayed, and the fungus to be controlled. The mixture can best be prepared in rather large quantities, say, enough for 200 gallons at a time, making the formula 32 pounds of lime, 32 pounds of sulphur, to be cooked with a small quantity of water—eight to ten gallons—and then diluted to 200 gallons. The lime should be placed in a barrel and enough water poured on to almost

cover it. As soon as the lime begins to slake the sulphur should be added, after first running it through a sieve to take out the lumps. The mixture should be constantly stirred, and more water added as needed to form a thick paste at first, and then gradually a thin paste.

The lime will supply enough heat to boil the mixture several minutes. When well slaked, water should be added to cool the mixture and prevent further cooking. It is then ready to be strained into the spray tank, diluted, and applied. Care must be taken not to allow the boiling to proceed too far, as some of the sulphur will then go into solution, forming sulphides, which are injurious to the foliage. The intense heat, violent boiling, and constant stirring results in a uniform mixture of finely divided sulphur and lime, with only a very small percentage of sulphur in solution. This mixture should be applied immediately after it is made with a good spraying outfit equipped with an agitator, Vermorel nozzles, &c.

Experiments with the above have been carried out for three years, and have included tests on peach brown rot, peach scab, cherry leaf spot, apple scab, apple leaf spot, sooty mould, bitter rot, and apple blotch, with various varieties of peaches and apples.

In addition to controlling the brown rot and the scab without injury to the foliage, the fruit sprayed with the self-boiled lime-sulphur was larger, more highly coloured, presented a much better appearance in the package, carried to market better, and commanded a higher price than the unsprayed fruit. However, there is some danger of staining the fruit if the mixture is applied within two or three weeks of the ripening period.

The experiments so far have been of doubtful value in controlling apple blotch and bitter rot. Two pounds of arsenate of lead added to every fifty gallons of the self-boiled mixture proved of value in controlling the codling moth, and was entirely harmless to the apple foliage.—*A. A. K.*

Limes in the New York Market, British West Indies. By W. N. Sands (*West Indian Bull.* vol. xi. No. 2, 1911).—At present Dominica supplies the best limes to the New York market. Their consumption is rapidly increasing, and, given certain essential points of improvement in the supply from the other West Indian islands, there is no reason why they should not control the market in this particular fruit, as there is little fear of competition at present.

But attention is especially required in the following matters: The limes should be carefully picked, cured, and graded. Those discoloured with earth or blight should be brushed or washed without injuring the skin, thoroughly dried, and then wrapped in brown paper. They should be graded as far as possible to the required size that happens to be in popular demand, and the fruit should be packed closely in layers in well-ventilated barrels.

Shipping facilities from islands other than Dominica need improvement.—*C. H. L.*

Lissochilus stylites (*Bot. Mag.* t. 8397).—Tropical Africa, Family, Orchidaceae; tribe, Vandeae. Herb, terrestrial, 3-5 feet high. Leaves linear-lanceolate, 2½-3 feet long; 1¾-2 inches wide. Scapes, 3-5 feet high. Racemes lax, 1 foot long, 6-9-flowered. Flowers purple, showy; sepals reflexed, 1-1½ inches long, pale-green tinged with lilac at the base; petals suborbicular, 1-1½ inches long, pale-purple.—*G. H.*

Loblolly Pine (Pinus taeda). By Henry S. Graves (*U.S.A. Dep. Agr., Forest Service, Circ.* 183).—A valuable tree for afforesting in the south-eastern parts of the United States, where it succeeds well, and is of large size and rapid of growth. The timber, however, is of no great value, being knotty and coarse-grained, but largely used for railroad purposes and box-making. It soon decays when brought in contact with the soil.—*A. D. W.*

Malus floribunda purpurea (*Rev. Hort. Belge*, p. 19, Jan. 1, 1911).—Messrs. Barbier, of Orleans, are offering a new ornamental apple, which is said to be richer in colour than any other of the garden varieties. It is a cross between *M. floribunda atrosanguinea* and *M. Niedzwetzkiana*, and is said to be an abundant and early bloomer. The flowers are of large size, crimson or bright cerise; stamens are pink, tipped with purple; buds are blood-red. The foliage is bronzy-purple when young, passing to dark-green shaded bronze. Below the bark the wood is blood-red shot with violet, and becomes pinkish towards the centre. The fruit is very decorative, and is about the size and colour of that of *Prunus Pissardi*—that is, dark red, passing to scarlet in the autumn.—*M. L. H.*

Malus Ringo. By E. Gienapp (*Oestr. Gart. Zeit.* vol. vi. pt. viii. pp. 289-91; 1 plate).—*Malus Ringo* is a highly decorative tree. The variety *M. R. fastigiata bifera* is specially recommended. The fruit makes a delicious preserve.—*S. E. W.*

Manure for Carnations, Roses, and Bulbous Plants (*Rev. Hort. de l'Algérie*, p. 284; Aug. 1911).—Three formulae for chemical manures arrived at by analysis of the respective plants.

For Carnations:

43	kilos of dried meat at 8 per cent. of nitrogen.
27	,, ,, dried blood at 10 per cent. of nitrogen.
21	,, ,, bone superphospate.
9	,, ,, sulphate of potash.

Use 50 to 60 kilos to the are in two or three applications.

For Roses:

37	kilos of dried meat at 8 per cent. nitrogen.
29	,, dried blood at 10 per cent. phosphoric acid.
22	,, bone superphosphate.
12	,, sulphate of potash.

Use 10 to 15 kilos to the are of this mixture during the summer and 15 to 20 kilos during the growing season in one or two applications.

For bulbous plants:

34 kilos dried meat at 8 per cent. nitrogen.
34 ,, dried blood at 8 per cent. nitrogen.
28 ,, superphosphate.
14 ,, sulphate of potash.

Use 10 kilos to the are of this at planting and 20 kilos during growing season in one or two applications.

All these doses may be somewhat increased, but must not be diminished.—*M. L. H.*

Maxillaria abbreviata Rchb. f. By E. B. Behnick (*Orchis*, vol. v. pt. vii. pp. 105-7; 1 plate).—Unlike most Maxillarias, *M. abbreviata* is a very attractive orchid. During January and February it produces a large number of brilliant copper-coloured flowers.—*S. E. W.*

Mesembryanthemum edule (*Rev. Hort. de l'Algérie*, p. 15; Jan. 1911).—Information is desired on a Mesembryanthemum from the Cape which furnishes a gummy substance used in the preparation of certain woven materials. It is supposed that *M. edule* is the one in question. It is commonly cultivated in Cape Colony, and bears a great quantity of fruit at the end of summer, known locally as "Hottentots' figs." These contain a great quantity of mucilaginous matter. *M. edule* is naturalized in different parts of the Algerian coast, and there is a flourishing plantation of it at the Tipaza lighthouse.—*M. L. H.*

Momordes revolutum (*Bot. Mag.* t. 8390).—Peru. Family, Orchidaceae; tribe, Vandeae. Herb, epiphytic. Leaves, recurved, 3-12 inches long. Scapes, 4-7 inches long. Flowers, showy, cinnabar-red with a yellow lip.—*G. H.*

Mosquito Plant, The (*Gard. Mag.* No. 2999, p. 296, April 22, 1910). Major H. D. Larymore described some years ago how when engaged in Northern Nigeria the basil plant (*Ocymum viride*) had the property of keeping away mosquitos. Men employed in the Victoria Gardens in Bombay were pestered by them and by malarious fever until a boundary hedge was planted of basil, when the plague of mosquitos abated and the fever altogether disappeared.

The same immunity from fever has been obtained by its use in West Africa. It has now been shown that the leaves of the plant possess a volatile oil containing 32 per cent. of thymol, which is a recognized antiseptic and powerful germicide.—*E. B.*

Mosquitos, Remedies and Preventives against. By L. O. Howard, Ph.D. (*U.S.A. Dept. Agr., Farm. Bull.* 444; April 1911).—Spirits of camphor rubbed on the face and hands or a few drops on the pillow at night will keep mosquitos away for a time. So also will oil of pennyroyal. Oil of citronella is one of the best substances to be used this way. A good mixture is: Oil of citronella, 1 ounce; spirits of camphor, 1 ounce; oil of cedar, ½ ounce.

A dense smoke will always drive away mosquitos, and for household purposes many different materials are suggested for fumigating, among which are pyrethrum powder, sulphur dioxide, powdered jimson weed (*Datara stramonium*), and Mimms' culicide, a mixture of carbolic acid crystals and gum camphor.

A Japanese physician recommends burning dried orange-peel.

V. G. J.

Mutisia Clematis (*Bot. Mag.* t. 8391).—Tropical Andes. Family, Compositae; tribe, Mutisiaceae. Leaves, pinnate, terminating with tendril. Heads, pendulous, $2\frac{1}{2}$-$2\frac{3}{4}$ inches long. Corollas of florets, bright-red. Ray-florets, recurved; disc-florets numerous; corolla $\frac{3}{4}$ inch across.—*G. H.*

Oak Pruner, The (Elaphidion villosum Fab.). By F. H. Chittenden (*U.S.A. Dep. Agr.*, *Bur. Entom.*, *Circ.* 130; Dec. 1910; 1 fig.).—This insect, which is the larva of a beetle, first attacks the wood under the bark, following the grain. As it grows it bores towards the base, later on following the axis of the twig and boring through the centre and excavating an oval channel for several inches. After cutting away the wood so that the wind will in time bring the limb to the ground, the contained larva retreats into its burrow and plugs up the severed end with its castings. Here it transforms to pupa, and assumes the adult stage in November.

Where the pruner occurs only in moderate numbers the health of the tree is not impaired, but the fallen twigs serve as a breeding-place for other wood-borers.

The species may easily be controlled by collecting and burning all twigs as they fall.—*V. G. J.*

Oak Wood, Reversion in. By I. W. Bailey (*Bot. Gaz.* pp. 374-80, Nov. 1910; 2 plates).—The author discovers in injured parts of the stem progressive stages which are similar to the stages of recapitulation in seedlings and to the condition in adult miocene oaks. The so-called primary rays of oak-wood appear to have been built up by an aggregation and fusion of numerous uniseriate rays.

G. F. S. E.

Odontoglossum grande, Peloric Flower Formation. By R. Schlechter and H. Fischer (*Orchis*, vol. v. pt. viii. pp. 119-22; 1 plate).—An example of abnormal development of the flower of *Odontoglossum grande* is shown in the accompanying plate.—*S. E. W.*

Oenothera Lamarckiana. By Mr. E. G. Hill (*Bot. Gaz.* pp. 136-40; Feb. 1911).—The author investigated the literature concerning the introduction of this plant into Europe. He considers that it is proved that Joannes Morus of England sent seed to Prosper Alpinus at Padua in 1614, or before that date. Joannes Prevartius of Padua sent seed to C. Bauhin at Basle in 1619. Bauhin's description was published in 1623.—*G. F. S. E.*

Oenothera, Mutants of. By F. M. Andrews (*Bot. Gaz.* pp. 193-201, Sept. 1910).—Describes the characters of *Oenothera Lamarckiana*, *O. biennis*, *O. laeta*, and *O. velutina*. The European *O. biennis* differs from the American type of the same plant. The so-called "twin hybrids" *laeta* and *velutina* are distinct, and so far as yet investigated constant forms.

Their anther cells do not open on rainy days and seldom on sunny days.—*G. F. S. E.*

Oranges, Stock for (*Rev. Hort. de l'Algérie*, p. 67, March 1911). There are two distinct types of orange stocks in Algeria, known as 'Citron Galeux' and 'Citrus de Floride.' One of these has violet-tinted flowers, and is more or less related to the lemon; the other is the real "rough-lemon," with white flowers, which derives from the lime. This last is the only variety which sufficiently resists disease, and in general no stock of which the buds or flowers are tinted with violet should ever be used.—*M. L. H.*

Orchard Insects, Information about Spraying for. By A. L. Quaintance (*U.S.A. Dep. Agr.*, *Year Book*, 1908; 5 plates).—Principally a description of spraying outfits and apparatus, with formulae of approved spraying solutions.—*V. G. J.*

Orchards, Irrigation of. By S. Fortier (*U.S.A. Dep. Agr.*, *Farmers' Bull.* 404, June 1910; 32 figs.).—The practical side of the subject is dealt with very fully. It is held that examinations of the tree itself are not sufficient as a guide to the best time to irrigate, but that it should be found out where the bulk of the feeding roots are located, and frequent tests made as to the moisture of the surrounding soil (p. 24).—*A. P.*

Orchards, Vegetable Pests in (*Gartenflora*, vol. lx. pt. xix. pp. 429-36).—Toothwort (*Lathraea squamaria*) attacks the roots of apple and pear trees, doing much damage. On no account should mistletoe be permitted to grow in orchards.

To protect trees from the attacks of the larger fungi, paint wounds on the stems and branches with tar and burn all diseased and decayed wood. Unprotected wounds give admission to the spores of *Polyporus caudicinus*, which does much damage to pear, plum, cherry, and nut trees. *P. squamosus*, recognized by its odour of fennel, attacks nut and pear trees. *Phaeoporus hispidus* confines its ravages to apple trees. *Ochroporus igniarius* is one of the commonest and most dangerous fungi in the orchard. Trees attacked by this parasite must be burned. The most dangerous of all is *Armillaria mellea*. This edible fungus is a parasite and a saprophyte. It attacks the tree at the junction of the root and the stem, penetrating the bark and destroying the woody fibre of the stem.

Pholiota squarrosa preys on apple, cherry, and nut trees; *Agaricus galericulatus* destroys apple and cherry trees; and *Hydnum Schiedermayeri* confines its ravages to the apple.

Rust fungi attack the leaves and stalks. Spraying with Bordeaux mixture or soda copper mixture (2 lb. copper sulphate, 2 lb. soda, 10 gals. water), collecting and burning fallen leaves, are the best remedies. *Puccinia ribis* attacks the black currant; *P. pruni*, stone fruit; *Phragmidium rubi*, the raspberry.

The fungi causing leaf-blotch require two hosts for their development. One of these is the juniper. It is therefore desirable to destroy all junipers in the vicinity of orchards. *Gymnosporanium sabinae* produces leaf-blotch on pear trees, *G. tremelloides* on apples, *G. confusum* on the quince.

Leaf-curl is caused on the peach by *Exoascus deformans*, by *E. pruni* on the plum, and by *E. bullatus* on the pear. *E. cerasi* produces swellings on the branches of cherry trees, from which a bushy growth develops. The branch must be cut away behind the growth and burnt.

In the case of mildew and false mildew, dust the foliage with flowers of sulphur or spray with Bordeaux mixture and burn diseased and fallen leaves. The best known forms of mildew are: *Podosphaera tridactyla*, on plums; *P. oxyacanthae*, on apples; *Phyllactinia suffulta*, on pears; *Microsphaera grossulariae*, on the gooseberry; *Oidium Tuckeri*, on the vine; and *Sphaerotheca pannosa*, on the rose. *Polystigma rubrum* makes large rusty spots on the leaves of the plum. *Stigmatea mespili* causes similar damage to the foliage of pears, quinces, and medlars. *Gnomonia erythrostigma* causes cherry-leaf scorch. Leaf-spot causes the leaves to fall off, and also the fruit. *Phyllosticta pirina* and *Septoria piricola* cause this in pears; *Ph. prunicola* is the agent in plums; and *Ph. cerasi* in cherries; *Ph. ribicola* in red currants; *Ph. fragaricola* in strawberries; *Ph. persicae* in peaches; and *Ph. vindobonensis* in apricots. *Gloeosporium ribis* damages the fruit of the currant and the gooseberry. Repeated spraying with Bordeaux mixture or soda copper may keep these fungi in check. Spraying with these mixtures is also a remedy for shot-hole due to *Cercospora circumscissa* and *Clasterosporium amygdalarum*, as well as for scab due to *Fusicladium* and mould caused by *Monilia fructigena*.—*S. E. W.*

Orchards, Winter Vetch for a Cover Crop in Michigan. By H. J. Eustace (*U.S.A. Exp. Stn., Mich., Circ.* 13, July 1911; 5 figs.). Tests in orchards and vineyards in different parts led to the conclusion that the winter, hairy, or sand vetch (*Vicia villosa*) is especially valuable for the purpose of a cover crop, and its value is now beginning to be appreciated. On the general subject of cover crops see abstract on "Orchard Green-Manure Crops in California," R.H.S. JOURNAL for December 1911 (vol. xxxvii. p. 470).—*A. P.*

Orchid Cultivation in Osmunda regalis Fibre. By R. Blossfeld (*Orchis*, vol. v. pt. viii. pp. 122-5).—Many epiphytic orchids thrive in Osmunda fibre, cut into pieces about three inches in length. Some dry fibre is placed above the drainage in the pot, the orchid inserted, and dry fibre pressed round it in small quantities at a time

until half the root stock is covered. Give plenty of water when the orchid is rooted. On repotting the fibre adhering to the root need not be disturbed. *Odontoglossum* and *Phalaenopsis* require a mixture of Sphagnum and young Osmunda fibre.—*S. E. W.*

Orchids, Exotic Cultivation of. By O. N. Witt (*Orchis*, vol. v. pt. v. pp. 66-70 and pt. vi. pp. 85-9).—Many orchids, which in their native state flourish when fully exposed to the sun, require partial shade in the orchid house. Most require for their roots an atmosphere saturated with moisture, and that is why they succeed in the long run better in a porous compost than they do when grown on blocks of tree-fern stems or wood. A pot with one hole at the bottom and a good layer of crocks below the compost gives a moister atmosphere to the roots than pots supplied with several apertures, which cause undue evaporation.—*S. E. W.*

Orchids from Madagascar. By F. Ledien (*Orchis*, vol. v. pt. viii. pp. 114-6; 1 plate).—The growth of the two giant orchids *Cymbidium Humblotii* and *Eulophiella Peetersiana* is shown in two photographs. The flower stalk of the former is more than three feet in height, and bears from fifteen to thirty flowers.—*S. E. W.*

Orchids in Dwelling Rooms. By A. Bräcklein (*Orchis*, vol. v. pt. v. pp. 71-3; 2 plates).—The successful results of two attempts at growing *Odontoglossum grande* in a dwelling room are shown in the illustrations. One plant bears 13 and the other 18 blooms.—*S. E. W.*

Oyster-shell Scale and the Scurfy-scale. By A. L. Quaintance and E. R. Sasscer (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 121; April 1910).—These two scales, next to the San José scale, are most injurious to orchards. The oyster-shell scale (=mussel-scale) (*Lepidosaphes ulmi=Mytilaspis pomorum*) is described, and its life-history and food-plants (about 110) are mentioned; its distribution is world-wide. The scurfy-scale (*Chionaspis furfura*) attacks mostly shrubby rosaceous plants. It winters like the former under the scales. It is a native North American insect. Pruning out dead wood is recommended. Spraying with lime-sulphur or with paraffin emulsion just after the young hatch out, and within about three weeks of the fall of the petals, is said to be the best means of dealing with the pest.

F. J. C.

Palm, Coquito Nut, Jubaea spectabilis. By Chas. Cochet (*Rev. Hort.* pp. 450-2; Oct. 1, 1911; 2 illustrations).—The data given appear to establish the thorough hardiness of this handsome palm, numerous specimens having survived a temperature of 16° below zero C. = 28° of frost F. The illustrations show a group planted in 1864 in Lattes, near Montpellier, and a bunch of fruit. Some of the trunks measure at the ground level over twenty feet in circumference.

C. T. D.

Palm Stems, Their Growth in Thickness in the Tropics. By Gregor Kraus (*Ann. Jard. Bot. Buit.* ser. ii. vol. iv. pt. i. pp. 34-44; 1911). This is a continuation of some previous work published by the author eleven years ago. In the winter of 1893-94 he carried out a series of measurements upon a number of palms growing in the botanical garden at Buitenzorg with the following results.

(1) Young palm-stems show a growth in thickness throughout their length from apex to base, which is quite obvious and clear even in the short interval of a few months.

(2) The successive partial growths in thickness along the stem from apex to base are, as might have been expected, unequal, although no definite law can be stated for all cases. In the first *Oreodoxa* examined the increase in growth is most marked above, and regularly decreases towards the base. In *Rhopaloblaste* the reverse was found to be the case. In *Drymophoeus* the absolute growth had taken place exactly equally above and below after three months. A comparison of the growth after the first month and after the third month showed, however, that this relation can vary. In the second *Oreodoxa* examined the greatest growth in thickness had taken place in the middle of the stem. This local growth in thickness produces the barrel-shaped swellings found upon the older stems of *Oreodoxa*. The regular strong growth of the base produces the bulb-like swelling of that region.

(3) Alf. Möller made some measurements of palms in Blumenau (Brazil), and found that these indeed grew in thickness, but to a far smaller degree than was found to be the case by Kraus in Java. He found, for example, that the stem of a *Euterpe* grew in two years only as much as Kraus's palm-stems had done in two to three months. Upon what this difference depends is still uncertain.

(4) For how long the growth in thickness of a palm-stem can continue could not be satisfactorily studied by Kraus, but in an *Areca catechu* of 15 metres height the stem showed no increase in thickness during two to three months. This period was quite long enough for younger plants to show a very clear growth in thickness.

(5) Lofty palm-stems, measured breast-high, showed no growth in thickness during two to three months.

Kraus points out that it is most desirable that these observations should be continued upon the same palms used by him in 1893-94. As he is unable himself to visit Buitenzorg again he gives in the present article a detailed description of the plants used by him, so that other observers who have the opportunity may carry on a fresh series of measurements upon these trees and study their growth after the lapse of so many years.—*R. B.*

Pansy, A Fusarium Disease of the. By F. A. Wolf (*Mycologia*, ii. pp. 19-22; Jan. 1910; fig.).—Plants attacked died suddenly. A dark, slightly sunken area on the stem near the collar of the plant, and destruction of roots, so that only small portions of the main roots

remained, were the prominent symptoms. In every case a species of *Fusarium* was found in the diseased portion and cultivated. Healthy plants were inoculated, and the disease was reproduced. The name *Fusarium violae*, sp. nov., is proposed for the fungus. It was noticed that plants growing in ground recently manured with fresh farmyard manure were the only ones to be affected.—*F. J. C.*

Parasitism displayed by Insect Enemies of Weevils, On some Phases of. By W. D. Pierce (*Jour. Econ. Entom.* iii. pp. 451-8; Dec. 1910).—The author enumerates some phases of superparasitism additional to those mentioned by Mr. Fiske in a previous paper (see JOURNAL R.H.S. xxxvii. p. 646). Owing to the numerous cases of superparasitism, etc., "it is seldom possible for parasitism to reach much above 45 to 50 per cent. of the total number of weevils in the field."—*F. J. C.*

Peach, A Bacterial disease of the. By J. B. Rover (*Mycologia*, i. p. 23; 1909).—A shot-hole disease of the peach is described and attributed to *Bacterium pruni.* The attack is characterized by somewhat angular, purplish-brown spots $\frac{1}{8}$ to $\frac{1}{4}$ inch in diameter, sometimes confluent. On the leaves the diseased tissues dry and fall out. Leaves drop prematurely, and the disease is worst in ill-pruned and ill-cultivated orchards. The organism was isolated, and infection experiments resulting in the disease were carried out by spraying leaves with the culture suspended in water. Shoots and fruits are also apparently attacked. The bark of the young shoots shows purplish-black slightly sunken areas $\frac{1}{8}$ to $\frac{3}{16}$ inch wide, extending two or three inches along the stem, sometimes girdling it. A small purplish spot occurs on the fruit, over which the skin soon cracks. The spots are small but numerous.—*F. J. C.*

Peach and Orange, A Gum-inducing Diplodia of. By H. S. Fawcett and O. F. Berger (*Mycologia*, iii. p. 151; 1911).—A species of *Diplodia*, probably *D. natalensis* Evans, was isolated from peach and orange trees in Florida, and, inoculated in healthy ones, produced gumming. The inoculations were made either in cuts or on young twigs. Attempts to inoculate through uninjured cork were unsuccessful. The fungus is known also in South Africa, where it produces decay in lemons and other citrus fruits.—*F. J. C.*

Peach, Bud Variation in. By Ed. Griffon (*Rev. Hort.* pp. 452-3; Oct. 1, 1911).—Report of two instances where the peach grafted on the almond has produced almond growths by bud variation when very old on the upper branches far removed from the graft. Such growths bore both true almond flowers and true almonds, but the latter fell when of small size.—*C. T. D.*

Peach in Colorado, Some Insects and Mites attacking the By George P. Weldon. **Two Plant Lice of the Peach.** By C. P. Gillette and George P. Weldon (*U.S.A. Exp. Sta., Colo., Bull.* 169;

Nov. 1910; 1 plate, 3 figs., 3 tables).—According to the authors, self-boiled lime-sulphur constitutes an effective remedy against 1, the peach-twig borer (*Anarsia lineatella* Zell.); 2, the peach-tree borer (*Sanninoidea exitiosa*); 3, the scale insects; 4, the green peach aphis (*Myzus persicae* Sulz); and 5, the black peach aphis (*Aphis persicae niger*).—*V. G. J.*

Peach, The Principal Insect Enemies of the. By A. L. Quaintance (*U.S.A. Dep. Agr. Year-Book*, 1905; 7 plates, 7 figs.).—Much loss by insect depredations is preventible by maintaining the trees in a healthy condition, fertilizing where necessary, thorough pruning-out of all dead wood, removal of dying and diseased trees, and careful spraying with good, well-mixed insecticides.

This bulletin deals with all the principal enemies of the peach, and gives their life-histories and methods of control.—*V. G. J.*

Peaches, Spraying for the Control of Brown-rot, Scab, and Curculio. By W. M. Scott and A. L. Quaintance (*U.S.A. Dep. Agr., Farmers' Bull.* 440; March 1911).—The value of the peaches annually grown east of the Rocky Mountains is 12,000,000 to 16,000,000 dols., and it is estimated that the brown-rot, the result of the attack of *Sclerotinia fructigina* is responsible for an annual loss of 3,000,000 to 4,000,000 dols. The peach-scab resulting from the attack of *Cladosporium carpophilum* is responsible for another 1,000,000 dols., and the plum curculio (weevil) (*Constrachelus nenuphar*) for a further loss of about 3,750,000 dols. The diseases are described (see Abstracts in previous issues), and are similar to the troubles produced by the same fungi in Britain. The weevil is a native American insect. Lead arsenate (2 lb. to 50 gals. of water) is regarded as the spray least likely to injure the fruit and effective against weevils, while self-boiled lime-sulphur is regarded as best against the fungi. The formula 8 lb. of lime, 8 lb. of sulphur, 50 gals. of water is suggested; and it is said that if the mixture is not allowed to remain hot in a concentrated form for any length of time, no injury will result to even such delicate foliage as that of the peach.—*F. J. C.*

Pear Blight, Scolytus rugulosus as an agent in the spread of Bacterial. By D. H. Jones (*Phytopathology*, i. 5, pp. 155-8; plates).—The bark beetle, *Scolytus rugulosus*, has been found in both healthy and diseased trees. Beetles issuing from the latter have been found to carry immense numbers of the blight organism, *Bacillus amylovorus*. The blight has been found spreading in otherwise healthy trees from the vicinity of borings made by the beetle. Experimental evidence is brought in support of the observations. It is recommended that all dead wood should be burned instead of being allowed to lie about in the orchard.—*F. J. C.*

Pears, Methods of Producing Valuable New (*Jour. Soc. Nat. Hort. Fr.* p. 596, Nov. 1911).—M. Noblot, in an address on this

subjects, recommended artificial fertilization. By our present haphazard system we are only in a position to be sure of the mother plant, and all our good varieties have come by chance. It would be a great advantage if we could also choose the male parent. The first generation often gives a new plant of no interest in itself, but which holds the power of variation, and may possess in a latent condition characters which will sow in successive sowings. Seed should be gathered without cross-fertilization, and in successive generations an interesting new plant may result. Unfortunately, this is a long process with pears, as they do not flower until they are eight or nine years old.—*M. L. H.*

Pears, New stock for. By J. A. Kleyhonz (*Oestr. Gart. Zeit.* vol. vi. pt. xii. pp. 460-3).—*Pyrus sinensis* is recommended as a stock for grafting pears. Time will show whether it answers expectations.
S. E. W.

Pecan Cigar Case-bearer, The. By H. M. Russell (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 64, pt. x.; Nov. 1910; 3 plates, 2 figs.).—The pecan cigar case-bearer (*Coleophor coryloefoliella* Clem.) is an insect of minor importance and feeds principally on nut-bearing trees, such as the walnut, pecan, and hickory. The larvæ feed on the tender buds and unfolding leaves. The larval case resembles a minute cigar.

Where the insect is abundant enough to be injurious it can be controlled by spraying the trees with arsenate of lead (3 lb. to 50 gallons water) when the buds are swelling.

Lime-sulphur mixture applied during the dormant season would give good results. Where trees are sprayed in spring for the bud-worm (*Proteopteryx deludana* Clem.) no further treatment will be required for the case-bearer.—*V. G. J.*

Pelargonium grandiflorum. By E. Foucard (*Rev. Hort.* pp. 523-4; Nov. 16, 1911; coloured plate).—The plate represents three very handsome forms, viz. 'Madame Ed. Macé,' pale mauve with radiating crimson centre; 'Caprice de Nini,' white suffused with pink and striped centrally and radially with carmine and 'F. de Lesseps,' intense crimson with light rose edges. Flowers bold, in good clusters. These represent the choicest of those shown in the Cours-la-Reine Exhibition. A descriptive list of others is given.
C. T. D.

Peony, 'Souvenir du Professeur Maxime Cornu.' By D. Bois (*Rev. Hort.* p. 472-3; Oct. 16, 1911; coloured plate).—The plate represents an extremely fine double form of Peony, a cross between 'Madame Louis Henry' (*P. Delavayi lutea*) and 'Elizabeth' (*P. Moutan*). The flowers are very large, about 8 inches across, are perfectly double, and of a bright canary yellow, with the edges of most of the petals, especially in the centre of the flower, irregularly margined with crimson. Other very handsome hybrids of similar class are men-

tioned, one, 'La Lorraine,' exhibited by M. Lemoine, being extremely like, but of pure canary colour. Both would appear to be of special decorative merit. The 'Souvenir' was raised by M. Louis Henry, of the Natural History Museum of France.—*C. T. D.*

Persian Flora. By J. Bornmüller (*Beih. Bot Cent.* vol. 27, Abt. ii. pp. 288-347; vol. 28, Abt. ii. pp. 225-67, 458-535).—These papers contain a full enumeration of the West Persian collections by Strauss. Most of the new species have been described elsewhere, but some few appear to be noticed in these papers for the first time.
G. F. S. E.

Pests and Diseases in West Indies, 1909-10, Report on Prevalence of some. By F. W. South, B.A., and H. A. Ballon, M.Sc. (*West Indian Bull.* vol. xi. No. 2, 1911).—Lists are given of fungoid diseases and insect pests, with notes thereon, succeeded by an index giving the name of crop, the disease or insect, and the island where prevalent.—*C. H. L.*

Petunias, New. By A. Heydt (*Gartenflora*, vol. lx. pt. xx. p. 448). —'Editha' is a small-flowered Petunia. The flowers are pink, with dark veins. 'King Alphonse' is a superb variety; it bears large dark purple flowers.—*S. E. W.*

Phlox Drummondi. B. A. Heydt (*Gartenflora*, vol. lx. pt. xxiii. p 517).—The best Phloxes are *P. splendens* (*coccinea albo-oculata*), brilliant scarlet with a white eye; *P. Isabellina*, large yellow flower, valuable for cutting; *P. stellata splendens*, scarlet with a white star; *P. albo-coerulea*, pure white with a dark eye.—*S. E. W.*

Phosphates as a Substitute for Basic Slag, Crude Mineral (*Gartenflora*, vol. lx. pt. xix. pp. 437-8).—Compared with basic slag, crude mineral phosphates are of little value even when ground to powder.—*S. E. W.*

Phyllodoce amabilis (*Bot. Mag.* t. 8405).—North America. Family, Ericaceae; tribe, Phyllodoceae. Shrublet, 6 inches high. Leaves, linear, 3-4 lines long. Flowers in clusters 5-7. Corolla campanulate, 3 lines long, 5-lobed, pink.—*G. H.*

Pinus Strobus, Injury to, caused by Cenangium abietis. By B. Fink (*Phytopathology*, i. 6, pp. 180-3).—It is well known that this fungus (= *Peziza abietis*, Pers., and *Cenangium ferruginosum*, Fr.) is a destructive parasite in forests. The author now describes a case where it has proved troublesome as a disease-producer among planted trees.—*F. J. C.*

Pitcairnia tabulaeformis (*Bot. Mag.* t. 8410).—Mexico. Family, Bromeliaceae; tribe, Pitcairnieae. Herb, almost stemless. Leaves, rosulate, 4-5 inches long. Inflorescence, shortly racemose, many-

flowered; bracts, green ovate; sepals, yellowish-white; petals, bright orange.—*G. H.*

Plant-associations, Cycles of. By Professor H. C. Cowles (*Bot. Gaz.* pp. 161-83; March 1911).—This article, "The Causes of Vegetable Cycles," is the address delivered as retiring President to the Association of American Geographers in December 1910.

The author gives a short historical *résumé*, including some remarks on the changes of flora in Carboniferous, Permian, Jurassic and Cretaceous times, which he is inclined to attribute to changes in humidity as well as alterations in the temperature. Most of the article deals with changes brought about by plant and animal agencies. Of these the "humus complex" is fully described. The most important effect of humus is, in his view, an increase in soil moisture on uplands, and a decrease in depressions. The increase in soil organisms (such, *e.g.*, as the saprophytic fungi, which makes the growth of beech forest possible) is also an important effect of humus accumulation. Another factor is soil toxicity, such as is shown by the detrimental substances in bogs. Other effects of humus are the increased amount of available plant food and differences in the temperature and aeration of the soil. The effect of Shade, of Plant Invasions and of Man are shortly described. The author points out that within one great climatic cycle there may be many cycles of "erosion," each with its own vegetative cycle. There is also a short bibliography giving a few recent American papers on the subject.—*G. F. S. E.*

Plant Production, School Exercises in. D. J. Crosby (*U.S.A. Dep. Agr., Farmers' Bull.* 408, p. 48; Sept. 1910; 39 figs.).—This bulletin is a reproduction of one written for elementary school teachers. The exercises are suitable for the upper standards of an English school, and provide excellent material for a lesson course to supplement school-gardening.

The exercises are grouped into two divisions. The first group deals with the plant itself, and the second part deals with the influence of the environment. In all there are forty-six exercises. Some of them can be met with in various English text-books on Nature study, but I have never yet seen a book where most of these exercises are given.

The author makes no claim to originality in these exercises, though some of them are rarely met with in text-books written for teachers in our schools.

Much that is valuable from a teacher's point of view can be obtained from the bulletin.—*W. W.*

Platycerium, Grape Sugar as an Excretion in. By R. Dümmer (*Ann. Bot.* xxv. pp. 1204-5; Oct. 1911).—*Platycerium grande* is shown to possess nectar-excreting tissues. In the early hours of the morning (6 A.M. to 9 A.M.), in the tropical ferneries at Kew, the lower surfaces of the young barren fronds, or "mantle leaves," are copiously studded towards their tips with drops of liquid, which

disappear later on in the day, and subsequently wholly at the maturation of the fronds. In *P. alcicorne* and *P. biforme* these exudations occur to a lesser extent. Notes on the structure of the nectaries are given. Similar tissues are only known amongst ferns in four other genera.—*A. D. C.*

Podocarpineae. By M. S. Young (*Bot. Gaz.* pp. 81-100, Aug. 1910; 3 plates).—Discusses the morphology of the Podocarpineae, and from a discussion of the embryological and anatomical evidence concludes that both this group and Araucarineae are very primitive and that they are probably related. Perhaps neither group has advanced far from the original ancestral conifer stock.—*G. F. S. E.*

Potato Blackleg, A Bacterial Disease of the Irish. By W. J. Morse (*U.S.A. Exp. Stn., Maine, Bull.* 174; Dec. 1909).—The symptoms of this disease, which is supposed to have been introduced in the States from England *viâ* Canada, are that attacked plants are unthrifty, light green, or even yellow, and undersized; the branches and leaves tend to form a rather compact top, and the young leaves often curl and fold up along the midrib. The most characteristic symptom is the inky-black discoloration of the stem, at or near the soil-surface, and frequently running some distance up the stem. The bacterium (probably *Bacillus solanisaprus*) produces soft-rot in the young tubers, and is apparently generally distributed in wounds, cracks, and decayed areas of seed-tubers. The bacillus is easily killed by drying, and is therefore not likely to be distributed on sound, smooth seed-stock. It is recommended that diseased, rough, and wounded tubers should be rejected, that sound ones should be dipped in formaldehyde or corrosive sublimate solutions before planting, and that rotation of crops should be practised.—*F. J. C.*

Potato Blight. By E. D. Butler (*Agr. Gaz. N.S.W.* vol. xxii. pt. v. pp. 409-12).—To prevent potato blight, the plants must be sprayed when the tops are about 6 inches high, with Bordeaux mixture. It is useless to spray after the potato is attacked by blight.—*S. E. W.*

Potato Blight, Irish. By S. R. Musgrave (*Agr. Gaz. N.S.W.* vol. xxii. pt. vi. pp. 519-21).—In districts where Irish Blight is prevalent, it is desirable to let the land lie fallow for two years and import new seed potatos.—*S. E. W.*

Potato-growing for Minnesota. By A. R. Kohler (*U.S.A. Exp. Stn. Minnesota, 17th Ann. Rept.* 1909; p. 334).—Gives an account of the cultivation of the potato under the conditions obtaining in Minnesota.—*F. J. C.*

Potatos, Leaf Curl Disease of. By H. F. (*Gartenflora*, vol. lx. pt. xvi. pp. 363-5).—Leaf-curl disease is checked by growing the potato in a very poor, sandy soil for one season. If grown in rotation with beet, on a clay soil or on an ordinary potato soil, the addition of chalk

to the usual manures acts beneficially. Chalk must on no account be used with a sandy soil.—*S. E. W.*

Potato "Seed" Stock, Proper Growing and Handling of. By C. D. Woods and W. J. Morse (*U.S.A. Exp. Stn., Maine*, July 1911). The export of northern-grown potatos for seed in Southern States is on the increase, and this bulletin deals with several points that have arisen in connexion with the trade. The need for securing a uniform stock true to name is insisted upon, and it is advised that the produce of only those plants which produce five to seven good and uniform tubers should be saved for seed purposes, and from these the general crop of seed potatos should be grown. The growing of test plots by the seed producers is also recommended. The seed, it is said, should be stored in cool houses and sent south only in cool weather. Diseases said to be carried by seed tubers are, that caused by *Phytophthora infestans*, dry-rot (*Fusarium*), blackleg (*Bacteriosis*), and scab. The symptoms of these diseases are dealt with, and means of selecting out diseased tubers described. It is recommended that potato sets should be stored in the dark (many British growers recommend that they should be exposed to light during storage). Care should also be exercised that bruising is avoided.—*F. J. C.*

Potato-spraying experiments in 1910. By F. C. Stewart, G. T. French, and F. A. Sirrine (*U.S.A. Exp. Sta., Bull.* 338; May 1911; 1 plate, xxv. tables).—A general summary of the experiments of the year indicates that those who spray most obtain the largest net profit. There is little danger of over-doing it. At Geneva six sprayings increased the yield 63 bushels to the acre, and three sprayings increased it 22 bushels. Flea beetles, early blight, late blight, and rot were all factors in the experiment.—*V. G. J.*

Potatos, Mutations in (*Rev. Hort.* p. 415; Sept. 16, 1911).—Dr. Edouard Heckel, Director of the Colonial Institute of Marseilles, reports on the mutations of *Solanum Maglia* under culture. The tubers obtained, about 4 lb. from each plant, were ripe at the beginning of August; they were all violet, like those of *Commersonii* 'Violet' of M. Labergerie, and of the same form. Their resistance to cryptogamic disease was altogether remarkable. Dr. Heckel also stated that M. Verne, Professor of the University of Grenoble, had, at his instigation, traversed much of South America to collect the wild potatos of the wild lands of the coastal regions and high up the Andes to a height of 3000 to 4000 metres. Visiting the Argentine, Chile, Brazil, Peru, and Bolivia, he has obtained a large number of tubers of numerous wild varieties, which will be subjected to Dr. Heckel's mode of studying bud mutation induced by plentiful applications of farm manure.—*C. T. D.*

Prickly Pears. By J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxii. pt. viii. pp. 696-7; 1 coloured plate).—*Opuntia imbricata* has escaped from cultivation and threatens to be a serious pest.—*S. E. W.*

Proteaceae. By E. Goeze (*Oestr. Gart. Zeit.* vol. vi. pt. ix. pp. 330-5, and pt. viii. pp. 308-11).—At the beginning of last century the Proteaceae were great favourites under glass, but the fashion has now changed. Among the most beautiful were *Dryandra longifolia*, *D. armata*, *D. nobilis*, *D. pteridifolia*, *D. tenuifolia*, and *D. plumosa*. *Banksia coccinea* is a beautiful shrub. *B. speciosa*, *B. dryanoides*, and *B. Victoriae* were highly prized. *Grevillea Leucadendron*, *G. chrysodendron*, *G. alpestris*, *G. Banksii*, *G. Hillii*, *G. Preissii*, *G. pulchella*, *G. punicea*, *G. pteridifolia*, *G. Thelemanniana*, and the giant *G. robusta* are all worthy of cultivation. Many species of *Hakea* are easily grown in a cool house; their bluish-green foliage is attractive.

Stenocarpus Cunninghamii is a great acquisition in Southern Europe. *Leucadendron argenteum*, the Silver tree of the Cape, is valued on account of its lovely foliage. The best worth cultivation of the Proteas are *grandiflora*, *pulchella*, *acuminata*, *formosa*, *radiata*, and *latifolia*. *Mimetes Zeyheri* has a pink involucrum. *Embothrium coccineum* from Chile bears red flowers. *Guevina Avellana*, an evergreen, is very attractive in gardens in the South of Europe.

S. E. W.

Prunus Sargentie (*Bot. Mag.* t. 8411).—Japan. Family, Rosaceae; tribe, Pruneae. Tree, the "Japanese Cherry," 80 feet in height, trunk to 3 feet diameter. Leaves, $2\frac{1}{2}$-$3\frac{1}{2}$ inches long. Flowers, rose-colour $1\frac{1}{4}$-$1\frac{1}{2}$ inches across. Drupe, purplish-black.—*G. H.*

Pulque. By A. Burgerstein (*Oestr. Gart. Zeit.* vol. vi. pt. vii. pp. 252-8; 3 plates).—Pulque, the national beverage of Mexico, is obtained from the Agave, generally from *A. atrovirens*, but many other species are used. When the seedlings have attained a height of four inches they are taken up, their leaves cut off, all except the central shoot, and the roots cut hard back. They are left to lie for seven days in the sun, and then replanted in a well-manured bed. Next year when they have reached a height of ten inches they are taken up again, the roots cut back, and replanted after exposure to the sun for fourteen days. They now send up abundant shoots in the axils of the leaves, which may be planted. The operation of root pruning and sun baths is repeated once more. When the plants are six to ten years old the central bud is cut off. Six months later the heart of the Agave is hollowed out, forming a vessel a foot and a half deep, which in the course of a week fills with liquid. This is collected twice daily. In good ground an Agave will yield from one to one and three-quarters of a gallon of aguamiel daily for eight months. The plant then dies. The liquid contains about ten per cent. of sugar. Some of the liquid is drunk as it is drawn from the plant, but most of it is fermented and converted into pulque.

S. E. W.

"Punkies," Notes on. By F. C. Pratt (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 64, pt. iii.; April 1907; 4 figs.).—The "punkie" (*Cera-*

topogon spp.) is a gnat which will bite and suck the blood of any exposed part of the body, and is very troublesome to man and domestic animals during or just before rainy weather in parts of Virginia, particularly in the Blue Ridge Mountains near Beaumont.

The adult is a minute fly 1 mm. in length, dark grey in colour, with mottled wings.

The larvæ are found on living trees in holes containing dirty water.—*V. G. J.*

Radish, Japanese-Daikon. By R. de Noter (*Rev. Hort. Belge*, p. 136, May 1, 1911).—Increased culture of the daikon or Japanese radish is strongly urged. It produces enormous crops, is easily cultivated, requires light soil, forms an agreeable and nourishing food for man, cooked, and is much relished by cattle. In Japan the daikon is much appreciated, and its cultivation is said to replace corn-growing in many places. In gardens the crop has the advantage of occupying the ground only for a very short time.

Eight varieties were recently exhibited by the writer at a show in Paris—'Sahura-Jima,' 'Ni-Nengu,' 'Mia-Shige,' Ku-Nichi,' 'Ki-Nashi,' 'Tokuri,' 'Kameido,' and 'Maru-Jiri.'—*M. L. H.*

Raspberry (*Rev. Hort. de l'Algérie*, p. 115, April 1911).—A hybrid, between *Rubus Idaeus* and *R. vitifolius*, seen in an Algerian garden is described as hardy, vigorous, and remarkable for the quantity of delicious fruit it bore all the summer.—*M. L. H.*

Rats, Poison for (*Rev. Hort. de l'Algérie*, p. 254, July 1911).—The bulb of the *Scilla maritima* is said to be poisonous to rats, though harmless to domestic animals. The bulb must be chopped up and mixed with meat, or made into a paste in the proportion of two-thirds cheese and one-third powdered Scilla bulb.—*M. L. H.*

Rehmannia × kewensis. By W. W. (*Gard Chron.* p. 268, April 6, 1912; with fig.).—Raised in 1910 by Mr. Coutts, *R. Henryi* × *R. glutinosa*, described as a good decorative plant.—*E. A. B.*

Respiration of higher plants, Some further investigations upon the effect of temperature upon. By Dr. J. Kuijper (*Ann. Jard. Bot. Buit.* ser. ii. vol. ix. pt. i. pp. 45-54; 1911; with two plates). This is a continuation of the author's previous work upon this subject. His former work had been carried out upon plants growing in the temperate climate of Europe, whilst the present research is upon the vegetation developed under the tropical conditions of Buitenzorg. He used seedlings of *Arachis hypogaea* and *Oryza sativa* for this research, and found that these behaved quite like the plants which he had studied in Europe. The two most important conclusions which he draws from his investigations are:—

(1) The effects of temperature upon the tropical plants examined is the same as upon the plants of temperate climates. The critical temperature is, however, 5° to 10° C. higher for the tropical plants than for those of Europe. This corresponds to the fact that the tem-

perature of Java is about 10° C. higher than the average temperature during the growing period in the temperate zones.

(2) The results obtained are quite in accordance with Blackman's views regarding physiological processes.—*R. B.*

Rhododendron ambiguum (*Bot. Mag.* t. 8400).—Western China. Family, Ericaceae; tribe, Rhodoreae. Shrub, closely branched. Leaves, lanceolate, 1½-3 inches long, pale beneath. Scales black. Corolla, 2 inches across, greenish-yellow.—*G. H.*

Rhododendron japonicum (*Bot. Mag.* t. 8403).—Japan. Family, Ericaceae; tribe, Rhodoreae. Shrub. Leaves, 3 inches long. Flowers, 3½ inches across, rose-coloured.—*G. H.*

Rhododendron spinuliferum (*Bot. Mag.* t. 8408). — China. Family, Ericaceae; tribe, Rhodoreae. Shrub, tall and thin, 3-8 feet high. Leaves, lanceolate, 1-1¾ inches long. Inflorescence, 4-flowered. Corolla, red, tubular, glabrous; tube, 7 inches long; lobes, 5, imbricate, regular.—*G. H.*

Rhododendrons in China. By G. Forrest (*Gard. Chron.*, p. 291, May 4, 1912; with illustration).—140 species are stated to be indigenous to China. Special mention is made of those on the Sungkwei-Longkong Range.—*E. A. B.*

Romneya trichocalyx. C. P. Raffill (*Gard. Mag.* No. 2993, p. 186, March 11, 1911; plate).—A native of California nearly allied to the well-known *Romneya Coulteri.* Flowers pure white, often four to five inches in diameter, with a cluster of rich yellow stamens in the centre. The calyx is oval and covered with a mass of hairs. It is considered preferable to *R. Coulteri*, as it flowers more freely and has very handsome silver-grey foliage.—*E. B.*

Roots, Oxidation and Reduction by. By O. Schreiner and M. X. Sullivan (*Bot. Gaz.* pp. 273-85, April 1911).—It is shown that in productive soils oxidation by roots is strong, and in poor soils relatively feeble. Whatever increases the development of the plant increases oxidation by the roots. Oxidation is due to bodies capable of fixing atmospheric oxygen in an active form. Reduction stages are prominent in the early stages of growth.—*G. F. S. E.*

Roots, Reduction by. By O. Schreiner and M. X. Sullivan (*Bot. Gaz.* pp. 102-30, Feb. 1911).—The authors give a short history of the literature dealing with the oxidizing power of the roots of many plants. Wheat seedlings were found to have the power of reducing nitrates to nitrites (in one case 6 parts per million). Reduction was also obtained with sodium tellurite and sodium selenite, but it is suggested that this was due to the metabolic activity of the roots or to other chemical reactions, and not to a special reducing substance formed by the roots.—*G. F. S. E.*

Rose, A dwarf 'Bordure' (*Rev. Hort.* p. 462, Oct. 16, 1911).—M.M. Barbier & Co., Orleans, have produced a Wichuraian hybrid described as absolutely dwarf, never exceeding a foot in height, so floriferous that foliage is quite hidden; flowers very double in corymbs of twenty-five to fifty flowers, which retain their colour throughout; recommended as a magnificent plant for borders or pots; colour pure carmine.—*C. T. D.*

Rose, 'Gloire de Dijon,' Effect of Drought on (*Rev. Hort.* p. 537; Dec. 1, 1911).—A long-established and very vigorous specimen, owing to the long drought of 1911, produced inferior flowers until September, when suddenly it was covered with a complete inflorescence of great single blooms, to which succeeded immediately after a crop of typical double ones on the same branches.—*C. T. D.*

Roses, The Best Hybrid. By K. Josefsky (*Oestr. Gart. Zeit.* vol. vi. pt. xi. pp. 404-9).—The following are regarded as the best hybrid roses for cutting or for planting in groups. 'Amateur Teyssier' (1899), 'Augustine Guinoisseau' (1899), 'Beauté Lyonnaise' (1895), 'Belle Siebrecht' (1895), 'Camoens' (1882), 'Duchess of Albany' (1898), 'Ferdinand Jamin' (1896), 'Franz Deegen' (1900), 'Grace Darling' (1883), 'Gloire Lyonnaise' (1884), 'Gruss an Teplitz' (1896), 'Gustave Regis' (1890), 'Her Majesty' (1886), 'Hippolyte Barreau,' 'Kaiserin Augusta Victoria' (1891), 'Killarney' (1898), 'Lady Battersea' (1901), 'La France' (1867), 'Liberty' (1901), 'La France' of 1889, 'Mme. Abel Chatenay' (1894), 'Mme. Alexandre Bernaix' (1877), 'Mme. Joseph Bonnaire' (1891), 'Mme. Caroline Testout' (1890), 'Mme. Joseph Combet' (1893), 'Mme. Jules Grolez' (1896), 'Mme. Ravary' (1899), 'Marquise Litta de Breteuil' (1893), 'Marquise de Salisbury' (1890), 'Mildred Grant' (1901), 'Papa Lambert' (1890), 'Pierre Guillot' (1879), 'Prinz de Bulgarie' (1901), 'Rosomane Gravereaux' (1899), 'Souvenir de President Carnot' (1894), 'Viscountess Folkestone' (1886).—*S. E. W.*

Rubi, New Chinese. By A. O. (*Gard. Chron.* p. 147, March 9, and p. 165, March 16, 1912; 6 figs.).—A useful list, arranged alphabetically, of the more interesting or ornamental of the brambles lately introduced from China. Description of twenty species or varieties are given, and thirteen are shown in the figures.—*E. A. B.*

Ruellia Derosiana (*Bot. Mag.* t. 8406).—Brazil. Family, Acanthaceae; tribe, Ruellieae. Undershrub, 1-1½ feet high. Leaves oblong, 2½-3 inches long. Softly herbaceous, upper surface dark green, with a white streak along the midrib; under surface purple. Flowers solitary; corolla, white 1¾ inches long, 1 inch across.—*G. H.*

Sandy Wastes, Planting of. By F. Rochau (*Gartenflora*, vol. lx. pt. xii., pp. 266-7).—Sandy wastes may with advantage be sown in early spring with a perennial Lupine, which has been previously treated with nitragin. Plants with flat rosettes of leaves help to bind

the sand together, such as dandelion, the greater Plantain, *Hieracium aurantiacum* and *H. pilosella*. Kidney Vetch, Sainfoin, Sickle Medick and Melilot. *Bromus inermis*, *Agrostis maritima*, Vernal grass and Sea Matweed also do well. They should not be mown the first year after sowing. Dwarf Sedum and Saxifrages, *Pyrethrum Tchihatchewii*, Chicory, *Ononis spinosa* and *Scabiosa canescens* may also be added with good effect.—*S. E. W.*

Sap, Ascent of. By J. B. Overton (*Bot. Gaz.* pp. 28-63, Jan. 1911; 1 fig.).—Gives a very full historical *résumé* of the papers dealing with the question of how far living cells in the stem assist in the raising of sap. His own experiments were carried on with *Cyperus alternifolius*. He found that when portions of the stem were killed by steam or by hot paraffin wax, the rate of transpiration was much reduced, and eventually the leaves withered.

But from the length of time necessary to produce withering and from appearances in the stem, he is inclined to consider that the check in transpiration may be due to disorganized substances clogging the vessels. In wax-killed stems where no such materials were seen, withering was much more gradual.—*G. F. S. E.*

Saprophytes of Java, Contributions to our Knowledge of. By A. Ernst and C. Bernard (*Ann. Jard. Bot. Buit.* ser. ii. vol. ix. pt. i. pp. 55-77, 1911; with 6 plates).—Part iv. of these contributions is from the pen of J. J. Smith, and deals with the systematic description and bibliography of *Thismia clandestina* and *T. Versteegii*. Part v. (by Bernard and Ernst) describes the anatomy of these two species. It is pointed out that the roots of these plants possess a normal root-cap which takes its origin from an initial layer which is common to the root-cap and the epidermis. The outer region of the cortex contains one (in *T. clandestina*) or two (in *T. Versteegii*) layers of cells occupied by the symbiotic fungus. The older roots appear to contain no true starch. The leaves of these plants are simple in structure, and possess no stomata on either the lower or upper surface.

Part vi. (by Bernard and Ernst) describes the embryology of *Thismia clandestina* and *T. Versteegii*. Although a complete series was not obtained, many of the more important stages of development were followed. The egg-apparatus and polar nuclei appear in the usual way; the antipodal cells are only feebly developed. The nucellar tissue, completely surrounding the embryo sac in the earlier stages, disappears laterally at a later period, and only remains as two caps over the ends of the sac. In *T. clandestina* (and probably also in *T. Versteegii*) the endosperm cells contain starch during the early stages of development, but this disappears later, and the reserve carbohydrate is stored in the greatly thickened cellulose walls of the endosperm. Two cells at the base of the endosperm in both species of *Thismia* are differentiated from the rest, and might easily be mistaken for antipodal cells. The embryo contained in the seed of

Thismia clandestina consists of a short three-celled suspensor bearing a round mass of cells at its end.—*R. B.*

Saussurea gossipiphora, &c. By G. Forrest (*Gard. Chron.* p. 85, Feb. 10, 1912; 2 figs.).—Two remarkable alpine species from the Lichiang Range, China. The illustrations show them in their natural habitats.—*E. A. B.*

Scutellista cyanea Motsch. By H. J. Quayle (*Jour. Econ. Entom.* iii. pp. 446-51; Dec. 1910).—An account is given of this insect which parasitizes the black scale (*Saissetia oleae* Bern.), devouring the eggs. The proportion of scales parasitized may reach 75 to 80 per cent., but not all the eggs under each scale are as a rule eaten. The life-history of the insect is given, and the effects of its parasitism considered.—*F. J. C.*

Seed Corn. By C. P. Hartley (*U.S.A. Dep. Agr., Farmers' Bull.* 415, 1910).—The increase in quality and yield obtained from good seed makes it worth while for farmers to give care and time to select the best ears of corn (Indian) for seed. Breeding of corn should be studied just as carefully as breeding of cattle, but each locality will require its own specialist. The seed should be well matured, and preserved with care till planting time.

In a series of tests it was found that well-cared-for seed gave a 12 per cent. increase on poor soil and a 27 per cent. increase on fertile soil above seed corn cribbed in the ordinary way.

Autumn is the time to select seed for the following spring.

C. H. L.

Seed Corn, The Curing and Testing of. By R. A. Moore (*U.S.A. Agr. Exp. Stn., Wisconsin, Circ.* 18, July 1910).—Care in selecting, curing, and testing seed corn would result in an increase of several million bushels in the the State of Wisconsin, and this could be quite easily achieved by attention to the following details, persistently carried out:—

1. Allow the seed corn to mature on the stalk. Pick ears 3 feet from the ground.

3. Secure well-formed ears.

4. Cure or dry the ears, either in racks or on corn-trees for small quantities, or in specially designed buildings for large quantities. A certain amount of warmth and good ventilation are essential.

5. Test vitality of each ear separately after a simple plan (described in pamphlet).

The county has inaugurated corn-growing contests for young people that will eventually improve the standard of seed corn used on farms, and also inculcate a love of country life in the rising generation.

C. H. L.

Seed Sterilization and its effect upon Seed Inoculation. By T. R. Robinson (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 67; Sept.

1910).—Metallic poisons, such as mercuric chloride, are difficult to remove even after repeated rinsings in water. Hydrogen peroxide was found efficient in eliminating bacterial contamination, and less harmful in its residual effects than other disinfectants tested. To sterilize them the seeds were treated for 30 minutes with full-strength (3 per cent.) commercial hydrogen peroxide.—*F. J. C.*

Seeds, Chemistry of. By W. Zaleski (*Beih. Bot. Cent.* Bd. 27, Abt. i. Heft 1, pp. 63-82).—A series of experiments bearing on the chemistry of ripening seeds is described. These show that albuminous substances are produced at the cost of other nitrogenous material, such as amido-acids, amides, &c. Neither light nor a moist atmosphere affects this process; nor is it stopped by absence of oxygen. He thinks that, in germination, the processes of ripening are reversed.

G. F. S. E.

Senecio saxifragoides (*Bot. Mag.* t. 8394).—New Zealand. Family, Compositae; tribe, Senecionideae. Herb, perennial. Leaves radical, oblong or nearly orbicular, 3-5 inches long. Scapes, up to 1 foot high, branched. Heads almost corymbose, $1\frac{1}{2}$ inches across, yellow.—*G. H.*

Septobasidium, Note on the biology of. By T. Petch (*Ann. Bot.* xxv. p. 483; July 1911).—An interesting case of the destruction of scale-insects by fungi. Species of the fungus genus *Septobasidium* frequently cause alarm in the tropics by clothing the stems of tea-bushes, mangos, and other trees. The author shows that in Ceylon the fungus always grows parasitically on colonies of scale-insects, which are overgrown and destroyed. The same doubtless holds good for other parts of the tropics.—*A. D. C.*

Shortleaf Pine (Pinus echinata). By Henry S. Graves (*U.S.A. Dep. Agr., Forest Service, Circ.* 182).—This is a valuable conifer in the Southern States, and the timber, which is light, straight-grained, and easily worked, is largely used as building material. On rich soils the growth is rapid, a diameter of 12 inches at 6 feet in height in forty years being not uncommon.—*A. D. W.*

Siam, Flora of. By. Dr. C. C. Hossens (*Beih. Bot. Cent.* Bd. 28, Abt. ii. Heft 3, pp. 357-457).—In this paper a nearly complete list of the plants collected by the author in that country during 1904 and 1905 is given, as well as references to various papers published elsewhere.

The rainy season is from mid-May to mid-October; the cold period lasts from October to February, and the hot season from beginning of March to May.

The flowering period is during the rains. The flora is closely related with that of Burmah, but has extremely slight affinity with that of Malaya. A new genus of Raffleriaceae, *Richthopenia*, is one of the most interesting discoveries, especially as this genus occupies an intermediate

position as regards other genera of that order. The primary flora is divided into 1, Littoral or mangrove; 2, Strand; 3, Marsh; 4, Savannah; 5, Savannah woods; 6, Dipterocarp woods; 7, Dipterocarp highland woods; 8, Teak forest; 9, Mixed deciduous highland wood; 10, Evergreen forest; 11, Evergreen highland woods, in which *Quercus* and Lauraceae divisions are distinguished; 12, Pine woods; 13, Rock and limestone mountain flora.

There are also secondary associations, such as 1, Rice-fields; 2, Jungle-fire association; 3, Small stretches about old temples; 4, Sacred teak groves; and 5, Sandbank flora. The new species described here for the first time belong to the following genera:—*Mastigobryum*, *Acanthocladium*, *Genatophyllum*, *Trichostomum*, *Tephrosia siamensis* J. R. Drummond, *Rhododendron Ludwigianum* Hors.—*G. F. S. E.*

Silver-leaf disease of Fruit Trees, Preliminary note. By H. T. Güssow (*Phytopathology*, i. 6, pp. 177-9).—The author reports the discovery of this disease in Nova Scotia and in other parts of Canada. A description of the disease is given and an account of work hitherto done with it. The successful reproduction of it by inoculation with *Stereum purpureum* is also reported.—*F. J. C.*

Soil, Injurious Substances in the. By O. Schreiner and T. J. Skinner (*Bot. Gaz.* pp. 161-81, Sept. 1910).—The authors extracted an organic constituent (dihydroxystearic acid) from the soil. This is injurious to the growth of wheat in water, even when potash, phosphate, or ammonia fertilizers are present, but has least influence in presence of nitrogen, and when the ratios of these fertilizers are favourable to plant life. It affects the withdrawal of fertilizers by the roots, and especially affects and deforms the roots.—*G. F. S. E.*

Soil Moisture and Desert Vegetation. By B. E. Livingston (*Bot. Gaz.* pp. 241-56, Oct. 1910; with 4 figs.).—Details of determination of soil moisture, depth of water and rainfall in four habitats near Tuscon are given. These four habitats are distinguished by different vegetations. The amount of water retained by the soil seems to be a very important factor in studies of distribution.—*G. F. S. E.*

Soils of the Columbia River Valley, Suggestions to Settlers on the Sandy. By B. Hunter and S. O. Jayne (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 60; July 1910; 2 figs.).—This bulletin gives much information of value to those for whom it is intended, especially with regard to irrigation and the most suitable crops to grow.—*A. P.*

Soils of the Eastern United States—the Portsmouth Sandy Loam. By J. A. Bonsteel (*U.S.A. Dep. Agr., Bur. of Soils, Circ.* 24, May 1911).—This occurs mainly in the tide-water portion of the coastal plain from Maryland to Mississippi, and there are about 774,000 acres of it. When drained it constitutes an excellent soil for corn, oats, and market garden crops, but the expense of clearing and drain-

ing is so great that the present prices of the lands which have been so treated scarcely justify the outlay on a large part of it.—*A. P.*

Soils of the Eastern United States—the Sassafras Silt Loam. By J. A. Bonsteel (*U.S.A. Dep. Agr., Bur. of Soils, Circ.* 25; May 1911).—This is confined to the coastal plain portions of New Jersey, Pennsylvania, Delaware, and Maryland, and has a total area of more than half a million acres, the whole of which is under cultivation. Prices range from $25 to $125 per acre. The surface is a mealy, soft, brown loam, and the subsoil a stiff, yellow, heavy silt loam, both of varying depth, but ultimately resting upon gravel or sand, thus ensuring adequate drainage.—*A. P.*

Soils, Moisture in. By L. J. Briggs and H. L. Shantz (*Bot. Gaz.* pp. 210-19, March 1911; 2 figs.).—Describes a wax seal method of estimating the amount of moisture in soils. The wax consists of 80 per cent. paraffin and 20 per cent. petroleum; this may be applied after planting the seeds, which grow up through it. Though the moisture may be from 1 per cent. in sand or 25 per cent. in heavy clays, or more in peaty soils, all vegetation may have dried up.—*G. F. S. E.*

Soils, The Control of Blowing. By E. E. Free and J. M. Westgate (*U.S.A. Dep. Agr., Farmers' Bull.*, 421; Dec. 1910; 10 figs.).—The ill-effects of the blowing of soil occur principally with sandy soils in the arid and semi-arid regions, but even in the humid sections the effect in the aggregate is of considerable importance wherever there are considerable areas of bare soil exposed to the continued action of strong winds. In the former it is no uncommon thing for farmers to lose an entire crop through the blowing out of the seed, or the uprooting, burial, or cutting off, of the young plants (p. 7). Where not excessive, however, especially if there is a sufficient annual rainfall, good effects may follow from the blowing of the soil in the mixing of the particles and the renewal of the surface layers. As an extreme instance of its beneficial effects is mentioned the removal of the fertile material from deserts and its deposition in other and often distant regions, when soils of great fertility and high agricultural value may be built up, as in the extreme case of the loess soils of China and Central Asia, and possibly some of the similar soils in the Mississippi Valley (p. 5).

The means by which damage may be prevented or decreased are, in principle, two—first, increasing the cohesion of the soil, as by increasing the water and humus content of the soil and modifying its texture; and, second, decreasing its exposure to the wind, as by providing a cover of growing vegetation, leaving the stubble of the last crop standing, providing an artificial covering of straw, brush lines, &c., and by planting wind-breaks.—*A. P.*

Sorrel. By G. Valder (*Agr. Gaz. N.S.W.* vol. xxii. pt. v. p. 392).—To eradicate sorrel apply lime (5 to 10 cwt. to the acre)

in autumn and plough and expose the roots to the frosts in winter.—*S. E. W.*

Spiraea Veitchii (*Bot. Mag.* t. 8383).—Central China. Family, Rosaceae; tribe, Spiraeae. Shrub, 12 feet spreading. Leaves, deciduous $\frac{3}{4}$-$1\frac{1}{2}$ inches long. Flowers in dense panicles; petals, white, $\frac{1}{6}$ inch across.—*G. H.*

Spiraea Wilsoni (*Bot. Mag.* t. 8399).—Central China. Family, Rosaceae; tribe, Spiraeae. Shrub, 6-8 feet high. Leaves, deciduous, oval, $\frac{3}{4}$-$2\frac{1}{4}$ inches long. Corymbs, terminal many flowered, $1\frac{1}{2}$-2 inches across. Flowers, pure white, $\frac{1}{4}$ inch across.—*G. H.*

Spraying, Failures in, and How to avoid them. G. R. Bliss Ames (*U.S.A. Hort. Soc., Iowa*, xiv. p. 338, 1911).—There are many causes of failure in spraying. Probably the chief of these is the fact that careful and thorough work is not done. The nozzles should be directed upon each tree until every crevice is soaked, every blossom filled, every twig and leaf and branch glistens with the drops of liquid. The proper amount to use depends upon the size of the tree, the way it is applied, as well as other factors. On the average an adult tree in full bearing should receive three to four gallons at each application, or twelve to twenty gallons during the spraying season.

If the work is imperfectly done many insects will survive and prove troublesome later. The second-brood worms will be very numerous and difficult to control. The best method of destroying the second brood of the Codling Moth is the complete destruction of the first by thorough work.

The spray to be applied just after the petals fall is by all means the most important in killing the apple worm. The stream must play upon the blossoms from above, because they face upward, and must be applied with sufficient force to penetrate the row of stamens and reach the calyx cup. About 85 per cent. of the first brood enter the apple through the calyx. If the spray does not reach the calyx cup the worms will work havoc with the fruit, regardless of the amount of liquid later applied.

Often the tops of the trees are neglected. One sometimes sees the upper branches almost bare of fruit and foliage while the lower ones are well covered—due to careless work.

Another cause of partial failure may be the use of materials which are adulterated. It is best to do business with a reliable firm, and not to buy materials always because they appear cheap.

The purity of Paris Green may be tested in either of the following ways: (1) Simply dissolve a little of the poison in a strong solution of ammonia. All the common adulterants are insoluble in this reagent, while the Paris Green is entirely soluble. Any solid material remaining in the ammonia must necessarily be of a foreign nature. (2) For those who have no ammonia at hand this method is useful—crush some Paris Green into fine powder. Any evidence of a white or yellowish colour

indicates adulteration. Pure Paris Green will remain a clear green in even the finest crystals.—*A. A. K.*

Stems and Mechanical Compression. By L. H. Pennington (*Bot. Gaz.* pp. 257-84, Oct. 1910; 2 figs.).—No increase in mechanical strength or in amount or kind of mechanical tissue in any of the stems used which were compressed longitudinally by light or heavy weights.—*G. F. S. E.*

Sterilization, Partial, of Glass-house Soils. By E. J. Russell (*Gard. Chron.* p. 97, Feb. 17, 1912, and p. 113, Feb. 24; 4 figs.).—A record of experiments carried out at Rothamsted, which show that it is advantageous to sterilize partially sick soil containing manurial residues.—*E. A. B.*

Stored Products, Papers on Insects affecting. By F. H. Chittenden, Sc.D. (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 96, pt. i.; March 1911; 2 figs.).—A list of insects affecting stored cereals, with description and life-history of the Mexican grain beetle (*Pharaxonotha Kirschi*) and the Siamese grain beetle (*Lophocateras pusillus*).

V. G. J.

Strawberries. By A. Janson (*Oestr. Gart. Zeit.* vol. vi. pt. ix. pp. 335-42).—The best season for planting strawberries is between the middle of July and the end of August. They like a well-worked soil, and may succeed early potatos or peas. This crop should be enriched by the addition of 220 lb. of basic slag to the acre and chalk if necessary. When this crop is harvested, stable manure is ploughed in, the ground rolled, and 88 lb. of sulphate of potash scattered over the ground. A fortnight later 40 lb. of sulphate of ammonia are added. Chile saltpetre must not be used instead of the ammonia salt. Not more than five or six varieties should be grown. The following sorts give a good succession:—

(*a*) 'Deutsch Evern,' 'König Albert von Sachsen,' 'Belle Alliance,' 'Kriegsminster von Roon,' 'Marguerite.'

(*b*) 'Sieger,' 'Laxton's Noble,' 'Dr. Hogg.'

'Deutsch Evern' is susceptible to mildew, 'König Albert von Sachsen' is not good on a very dry soil. The best sort for preserving is 'Jucunda.' After the fourth crop the plants should be destroyed. Every autumn long stable manure is spread between the rows and drawn slightly over the plants; in spring this is dug in, and the plants protected by brushwood. When the plants begin to flower the ground is well soaked with water. As soon as the fruit begins to ripen no more water is given. After the crop is gathered, the ground is hoed, a little later the runners are cut off. About $1\frac{1}{2}$ cwt. to the acre of superphosphate is hoed in, and a fortnight later the same quantity of sulphate of ammonia; two weeks later nearly $2\frac{1}{2}$ cwt. of kainit are added.—*S. E. W.*

Strawberries, Newer Varieties of, and Cultural Directions. By O. M. Taylor (*U.S.A. Exp. Stn., New York, Bull.* 336; April 1911;

1 plate; 3 figs.).—This bulletin gives a report on fifty varieties of strawberries, many of them recent introductions. Eleven of these varieties produced flowers without stamens, and therefore needed to have perfect-flowering varieties growing near them to ensure fertilization (p. 72).
A. P.

Sugar Industry of the Island of Negros. By Austin H. Kirby (*West Indian Bull.* vol. xi. No. 3, 1911).—The sugar industry was introduced into the island by a religious order in 1849, and increased rapidly with the population until 1893, the year of its greatest development, when the maximum yield was recorded. Since then the industry has gone back from various causes, and is about 60 per cent. of the maximum at present. Under the old system the annual sugar production in Negros for the next fifteen years might be about 220,000 tons. The adoption of modern methods of manufacture and improved modes of cultivation would probably double the output, and would enable the island to take a very important place in the production of sugar.—*C. H. L.*

Sulphur Requirements of Farm Crops in Relation to the Soil and Air Supply. By E. B. Hart and W. H. Peterson (*U.S.A. Exp. Stn., Wisconsin, Research Bull.* 14, April 1911).—The high sulphur content of the sheep's fleece (about 2 per cent. of the crude wool) has raised the problem of the relative amounts and forms of this element in feeding materials, and investigations to this end have led to the consideration of the adequacy or otherwise of the natural sources of supply of this element for continuous crop production.

It is generally recognized to-day by agricultural chemists that the amount of sulphur in plant materials, as determined in the ash, is in most cases too low. A large number of total sulphur determinations have been made on common farm products, and for this work the peroxide method as outlined by Osborne has been used, though the water was not completely boiled off from the hydroxide as directed by that method (p. 2). The results show a much higher content of total sulphur trioxide in plant materials than is found in the ash, rice grain yielding 100 times as much as the ash of that grain, and corn and wheat 40 times as much as the ash of those grains. In oats, cotton-seed, and soy beans, the total sulphur trioxide is about ten times, and in onions and cabbage two to four times, that found in the ash of those materials. The volatile sulphur oils in these products are in part responsible for the amount of sulphur lost in ignition. In the case of hays and straws the losses are much less, the amount of sulphur trioxide recovered in the ash of mixed hay, for example, being nearly as large as that found in the original material, and in alfalfa and clover hay about 50 per cent. It is evident from this that farm crops in general remove much more sulphur from the soil than has been supposed (pp. 3 and 4).

There are difficulties in the estimation of the total sulphur of soils, most of the determinations hitherto carried out having been made by

extraction with strong hydrochloric acid, which does not give the total content. Fusion of the soil itself with an alkali is considered to be probably the most correct process, though even this is liable to error (p. 7).

Taking into account the fact that an average crop of seed from cereal plants removes from the soil about half as much sulphur trioxide as phosphorus pentoxide, and that the straw removes a somewhat larger quantity, while the Cruciferae are heavy sulphur-using plants (p. 6), the authors hold that, compared with phosphorus, the amount of sulphur at the disposal of crops in normal soils is, on the average, lower (p. 8).

To determine definitely the effect of continuous cropping on the sulphur content of soils a number of analyses of cropped, virgin, and manured soils have been made, and the results show that on an average 40 per cent. of the sulphur trioxide has been lost from the cropped soils (p. 12). Where farm manure, however, has been applied in regular and fairly liberal quantities the sulphur content of the soil has been maintained and even increased (p. 13).

The amount of sulphur precipitated by rain, and the amount lost by drainage, vary with the locality, but it is held that the grains from the atmosphere cannot serve as a complete compensating factor for the losses sustained by cropping and drainage (p. 16), and that future systems of manuring will have to take this into account.

The views outlined are given with extreme caution, and the authors express the hope that further researches will be made (p. 21).—*A. P.*

Sweet Pea Disease, A Study of some Gloeosporiums and their Relation to a. By J. J. Taubenhaus (*Phytopathology*, i. 6, pp. 196-202; Dec. 1911; plates).—The "wilt" disease of sweet peas was found to be associated with a species of *Gloeosporium.* The disease occurs on stems, flowers and pods, but principally on the latter. The affected parts wilt and finally die from the tips of the younger shoots downwards. The dead parts shrivel, and on these the fungus fruits. The affected pods are at first dirty white, but assume a dull colour later owing to the production of spores upon them. The seeds of diseased pods shrivel and frequently fail to mature.

The fungus was isolated and found to be identical with that producing bitter rot of the apple (*Glomerella rufomaculans*), as Sheldon has already shown. The experimental evidence is given in detail, and appears to admit of no doubt as to this being the cause of the disease. The *Gloeosporium* from *Podophyllum peltatum*, *G. gallarum* from oak galls, *G. officinale* from *Sassafras* were also found to cause the disease when the spores were sprayed on the peas or were inoculated into the plants by punctures.

Glomerella psidii and the *Gloeosporium* from *Persea* failed to reproduce the disease. The spores are capable of surviving the winter, and diseased pods were kept both in the laboratory and outdoors, and the spores upon them found to be viable in the following spring. The

author considers it probable that the disease is carried over to the next season on seeds from diseased plants.—*F. J. C.*

Sweet Potatos, Trichoderma Köningi, The cause of a Disease of. By M. I. Cook and J. J. Taubenhaus (*Phytopathology*, i. 6, pp. 184-9; plates).—The disease described is a dry rot which spreads in the tubers in all directions from the point of origin and completely girdles the tubers. The fungus *Trichoderma Köningi* was isolated from the diseased spots and grown in pure culture. It was found to reproduce the disease readily when it gained an entrance into the plant through a wound. The disease is characterized by spots at first circular and light brown with a tendency to wrinkle. The flesh is hard and water soaked, brown with a black zone around it. A luxuriant white mycelial growth is formed on the surface of the diseased area after some time. The symptoms are similar to, but not quite the same as, those found in the tubers in store. A comparison is made between the fungi *Trichoderma Köningi* and *T. lignorum* and their growth characteristics described. Both species are capable of causing a rot of sweet potato.—*F. J. C.*

Symbegonia rubro-villosa (*Bot. Mag.* t. 8409).—New Guinea. Family, Begoniaceae. Herb, 5-8 feet high. Stems tinged with red. Leaves very unequal at the base and auriculate, 2½ inches long. Flowers, monœcious; calyx (perianth) segments, males 2, females 5, gamosepalous; corolla, pale yellow campanulate.—*G. H.*

Tar on Roads, Influence on Surrounding Vegetation. By J.-Ph. Wagner (*Jour. Soc. Nat. Hort. Fr.* ser. iv. vol. xii. p. 511, Oct. 1911).—A note on what seems to be the established fact, that the dust from tarred roads is harmful to surrounding trees and plants, both by clogging their pores and by its direct chemical action. Modern traffic unfortunately makes tarred roads a necessity. It is, therefore, for horticulturists to discover the means of counteracting or evading these ill effects. One suggestion is that only such trees and plants should be grown in the neighbourhood of main roads as are known not to suffer. On the other hand, Mr. Lloyd-Davies, Engineer of Roads and Bridges in Egypt, is convinced by his observations that the dust is only harmful for the first fifteen days after the tar is applied, so that if all dust were prevented for that time he considers that no bad results would follow.—*M. L. H.*

Tarred Roads, Effect on Vegetation in vicinity. By L. Mangin (*Rev. Hort.* pp. 417-9; Sept. 16, 1911; 3 illustrations).—Report of results demonstrating that the tarring of roads is detrimental to adjacent trees. The illustrations show the destructive effect on foliage of Catalpa, Robinia, and Acer observed along thoroughfares partly tarred and partly not. The foliage in the former case is much reduced in size, and defectively developed. This is imputed to poisoning by tarry emanations and also by the deposition

of dust containing tarry particles on the leaves. Private gardens along the tarred routes also suffer considerably by the same cause.
C. T. D.

Tarred Streets, Damage to Plants by Dust from. By F. Fischer (*Oestr. Gart. Zeit.* vol. vi. pt. viii. pp. 291-6).—Trees and bushes are damaged by the vapour from hot tar. Where cold tar is used on the roads no injury is caused to vegetation.—*S. E. W.*

Tea-root Diseases. By T. Petch (*Circ. and Agr. Jour. Roy. Bot. Gard. Ceylon*, v. pp. 95-114; 1910).—Five separate root-diseases at one time confused under that caused by *Rosellinia* are described and distinguished. They are produced respectively, by *Ustulina zonata*, *Hymenochaete noxia*, *Poria hypolateritis*, *Botrydiplodia theobromae*, *Rosellinia bothrina*.—*F. J. C.*

Temperature coefficient of the Duration of Life of Barley Grains. By T. H. Goodspeed (*Bot. Gaz.* pp. 220-4, March 1911). Fifteen thousand seeds were used, and 300 separate determinations were made. The duration of life was taken to be the time in minutes for which a given temperature must act in order to inhibit subsequent growth. This was found for all temperatures from 55° to 70° C. The coefficient is about 11 for a temperature interval of 10°. At 55° duration of life was 65 to 70 minutes, and at 70° $1\frac{1}{2}$ to 2 minutes.
G. F. S. E.

Thistles, The Control of Quack Grass and Canada. By A. L. Stone (*U.S.A. Agr. Exp. Stn., Wisconsin, Circ.* 19, July 1910).—Preventive measures have not been sufficient to check weed increase on Wisconsin farms, so this circular describes remedial measures on the lines of eradication.

On large areas persistent ploughing and harrowing either with a crop or, better still, on fallow is the best means of destroying both pests.

On small areas, covering the ground with heavy paper after cutting the weeds will eradicate them, providing the ground is level; otherwise close cultivation will answer the same purpose.

Canada thistles, but not quack grass, can be killed by a good stand of alfalfa, and for scattered plants, or very small patches, carbolic acid or gasoline can be used. Salting is a good plan, especially if cattle are pastured on the field, as they will destroy the thistles to get at the salt.—*C. H. L.*

Thrips, The Greenhouse. By H. M. Russell (*U.S.A. Dep. Agr. Bur. Entom., Bull.* 64, pt. vi.; August 1909; 3 figs.).—The damage caused by the greenhouse thrips (*Heliothrips haemorrhoidalis* Bouché) is confined to the foliage of ornamental plants. Adults and larvae both obtain their food by puncturing the epidermis of the leaf, and after lacerating the tissue they suck out the plant juices at the point of attack. They then transfer their attentions to another part

of the leaf, so that in time it becomes full of tiny pale-coloured spots where the tissue and chlorophyll have been extracted.

Fumigating with nicotine papers and liquid extracts gave the best results in a series of experiments.—*V. G. J.*

Timber outlook and need for Afforestation, Home. D. Munro (*Gard. Mag.* No. 2989, p. 113, Feb. 11, 1911).—In a lecture given at the annual meeting of the Aberdeen branch of the Royal Scottish Arboricultural Society, it was pointed out that there were signs of exhaustion of foreign and colonial forests, and that the end of the Scottish resources was in sight.

The value of home-grown timber is as great as foreign, and there are thousands of acres suitable for planting which at present are almost valueless.

Failure often results because unsuitable varieties are planted and the conditions of soil and situation are not understood.

It is suggested that the State should help in the rearing of young trees, and that it should not discourage planting by raising the assessment on new plantations. The terrible damage done by squirrels is dealt with, the amount in one case being put as high as £9000 on 600 acres.

If ten million out of the twenty million waste acres of Britain were planted, it would find regular employment for 100,000 men as foresters and labourers, to say nothing of the larger number who would be employed in subsidiary work.—*E. B.*

Timbers, The Relative Durability of Post. By J. J. Crumley (*U.S.A. Exp. Stn., Ohio, Bull.* 219, June 1910).—An interesting series of experiments as to the relative durability of various kinds of timber when used as fence-posts. The various tables of the ages and life of the various woods experimented upon should prove very useful to those who have to do with the erection and maintenance of wood fences. The facts deduced from the experiments are interesting and valuable.

A. D. W.

Toads, To Breed. By Pierre Mercadel (*Rev. Hort. de l'Algérie*, p. 211, June 1911).—A curious note by a writer, who signs himself "The Friend of Toads," on breeding them in a garden. He informs us that he has busied himself in breeding these insect-eating animals for some years, and that he reckons that a couple will produce 500 or 600 eggs in each season, and that each toad will be responsible for the destruction of a great quantity of harmful insects.—*M. L. H.*

Togo, Plants of economic importance from. (2) Fibres, &c., (3) Secretions. By G. Volkens (*Not. König. Bot. Berlin, Appendix* xxii. No. 3, pp. 65-119; Nov. 1910; with text-figs.).—The first five pages of this contribution conclude the account of the plants of Togo which yield fibres, &c. The rest of the work is occupied with a description of plants from this region of Africa which furnish secretions of

economic importance. Under the name of secretion are included gums, resins, caoutchouc, fats, oils, tannins, and pigments.

Amongst the more important of the plants described may be mentioned: *Elaeis guineensis*, the oil palm; *Ficus Vogelii*, which yields a rather impure caoutchouc; *Moringa oleifera*, from which is obtained a valuable machine oil especially useful for clocks and watches; a number of *Acacia*-species, important for the gum they furnish; *Indigofera tinctoria*, the indigo-plant; *Arachis hypogaea*, the ground-nut, or earth-almond; *Jatropha curcas*—yields an oil known as *oleum Ricini majoris*; *Ricinus communis*, the castor-oil plant; *Sterculia tragacantha*, which secretes a gum; *Butyrospermum Parkii*—a valuable fat known as sheabutter is obtained from this plant; and *Landolphia*—species which furnish a caoutchouc used in the manufacture of india-rubber balls.

R. B.

Tomatos, Growing for the Canning Factory. By James Troop, C. G. Woodbury, J. G. Boyle (*U.S.A. Agr. Exp. Stn. Purdue*, *Bull.* 144, 1910).—Tomatos grown as a field crop by the general farmer for canning purposes are an important item of agriculture in Indiana (about 30,000 acres annually), but as at present conducted the operation is by no means always successful. Inferior plants are set, poor seed is used, little care is exercised in studying the soil and cultural requirements of the plant, and last, but not least, thorough and constant cultivation is not practised. If the farmers would plant smaller areas and use more intensive methods of culture, they would find it pay.—*C. H. L.*

Torenia atropurpurea (*Bot. Mag.* t. 8388).—Malay Primula. Family, Scrophulariaceae; tribe, Gratioleae. Herb, perennial. Stems slender, branched and prostrate. Leaves ovate, $\frac{2}{3}$-$1\frac{1}{2}$ inch long. Flowers, solitary; corolla, dark purple with long spur, $1\frac{1}{2}$ inch long; mouth, $\frac{3}{4}$ inch across.—*G. H.*

Trade Relations between Canada and the West Indies (*West Indian Bull.* vol. xi. No. 2, 1911).—The essence of the conclusions reached by the Commission is that it is essential for the prosperity and even the solvency of the West Indian islands that the Canadian market should be available for their produce, and for this purpose sufficient and effective steamship communication must be maintained.

Imperial assistance to the Department of Agriculture cannot be withdrawn without rendering fruitless the efforts that this Department has made towards the introduction of other industries besides that of sugar production.

Much the same conclusions are reached by the Imperial Commissioners of Agriculture for the West Indies on the development of a West Indian fruit trade.

The subject is threefold:—

(1) The production of fruit.

(2) The circumstances of the market in which the fruit is sold.

(3) The means of transport, which may be briefly summarized as follows:—

The West Indies are capable of producing large supplies of fruit (bananas, citrus fruits, pineapples, and soft fruits). It would be well if the buyer could make his purchases in the West Indies, and undertake packing and shipping. Regular and frequent steamer communication is essential, the boats to be fitted with cool, not cold, storage accommodation. The payment of a subsidy is desirable.—*C. H. L.*

Transpiration-Current, Air bubbles in the. By Wlad. Schaposchnikoff (*Beih. Bot. Centralbl.* Bd. 27, Abt. i. Heft 3, pp. 438-44; with 2 figs.).—The author considers that these bubbles (Jamin's chain) are formed of carbonic acid and other gas diffusing out of the sap. He describes an ingenious apparatus by which similar bubbles can be produced in a glass tube, and considers that, as shown in such experiments, the gas will diffuse through cross membranes in consequence of differences in tension in the element above and below such membranes.
G. F. S. E.

Tree Cavities, Filling. By J. J. Levison (*Mycologia*, i. p. 77; 1909).—A good description of this necessary work in preserving old trees is given, with illustrations of the work to be done.—*F. J. C.*

Trochila populorum Desm. By C. W. Edgerton (*Mycologia*, ii. p. 169; 1910; fig.).—The author believes that the common fungus *Marssonia castagnei* (Desm. and Mont.), which causes brown spotting of the leaves of *Populus alba*, is a stage in the life-history of *Trochila populorum*, which occurs on dead leaves in spring. He did not succeed in tracing the whole life-cycle.—*F. J. C.*

Ulmus, British. By C. E. Moss, D.Sc. (*Gard. Chron.* 1912, March 30, p. 199; April 6, p. 216; April 13, p. 234; 3 figs. and 1 map).—The British Elms are here arranged under nine heads, thus:—

1. Ulmus campestris L. *Sp. Pl.* 235 (1753) partim; *Fl. Angl.* (1754). The English Elm (= U. procera Salisbury, *Prodr.* 391, 1796).

2. U. sativa Miller, *Gard. Dict.* ed. 8, no. 3 (1768). The Small-leaved Elm (= U. suberosa Ehrhart, non auct. pl. = U. Plotii Druce*).

3. U. nitens Mœnch, *Meth. Pl.* 333 (1794). The Smooth-leaved Elm (= P. glabra Miller, non Hudson).

4. U. glabra Hudson, *Fl. Angl.* 95 (1762). The Wych Elm (= U. scabra Miller = U. montana Stokes).

5. U. glabra Hudson × nitens Mœnch—(*a*) U. hollandica. The Dutch Elm (= U. hollandica Miller, *Gard. Dict.* ed. 8, no. 5, 1768 = U. major Smith, *Engl. Bot.* t. 2542, 1814).

6. U. minor Miller, *Gard. Dict.* ed. 8, no. 6 (1768). Plot's Elm (but not U. Plotii Druce).

* In *Journ. Northamptonshire Nat. Hist. Soc.* xxi. 88 (Nov. 1911). See also *Gard. Chron.* 1. 408 (1911).

7. U. stricta Lindley, *Synops.* 227 (1829). The Cornish Elm.

8. U. stricta Lindl. var. sarniensis comb. nov. The Jersey Elm (= U. campestris var. sarniensis Loudon, *Arboret.* iii. 1376, 1838).

9. U. glabra Hudson × nitens Mœnch—(*b*) × U. vegeta. The Huntingdon Elm (= U. glabra Mill. var. vegeta Loudon, *Arboret.* iii. 1404, 1838 = U. vegeta Ley in *Journ. Bot.* xlviii. 68, 1910).

Of these nine Elms, the first four were founded by Goodyer, so far back as the year 1636, in the so-called "emaculate" edition of Gerard's *Herball*, really the second edition revised and enlarged by Johnson. The fifth was founded by Plukenet, the sixth by Plot, the seventh by Lindley, and the last two by Loudon.

Of these, 5 and 9 are considered hybrids; 6, probably a sport or hybrid and not truly British; 8, a varietal form of 7.

Good accounts of the synonomy, descriptions, and herbarium specimens of most of these are given.

It should be noted that the writer identifies U. Plotii Druce with U. sativa Miller, and Plot's Elm with U. minor Miller.

Notes follow on seedlings—suberosity, roughness and size of leaves, and a key and conspectus conclude this important article.—*E. A. B.*

Ulmus Plotii, sp. nov. By G. C. Druce (*Gard. Chron.* p. 408, Dec. 9, 1911; 2 figs.).—Description and short Latin diagnosis.

——. By G. S. Boulger, *ibid.* p. 35, Jan. 20, 1912.—Identifying U. Plotii Druce with U. glabra Miller.

——. By G. C. Druce, *ib. loc. cit.* A reply stating that *U. Plotii* Druce has smaller leaves and different habit and time of flowering from those of U. glabra.

——. By C. E. Moss, D.Sc., *ibid.* p. 216, April 6.—Identifying *U. Plotii* Druce with *U. sativa* Miller.—*E. A. B.*

Variation in Foxgloves. N. C. Macnamara (*Gard. Mag.* No. 3035, p. 971, Dec. 30, 1911).—Out of fifty-four plants of *Digitalis purpurea* raised from seed sown in 1906, fifty-one were normal, but three were sports. In the first the flowers of the lower half of the stem possessed only a bifid upper petal and seven stamens; the upper part of the spike was normal.

In the second all the flowers had a bifid upper petal, seven stamens, and a style.

In the third—a spike of sixty inches—the flowers consisted of nine stamens, a style, but no vestige of petals. Seeds from these sports produced their like in 1909, with the addition of terminal flowers totally different from the parent. Seeds from these terminals produced their like in 1911, so that two distinct strains have now been obtained.
E. B.

Viburnum. By E. Gienapp (*Oestr. Gart. Zeit.* vol. vi. pt. ix. pp. 327-9; 1 plate).—*Viburnum Opulus sterile* (the snowball tree) likes a sunny position and plenty of nourishment. It flowers on the new wood and requires pruning once in two or three years.—*S. E. W.*

Viburnum Davidii. By D. (*Garden*, p. 204, April 29, 1911).—This is one of a number of new Viburnums introduced within the last few years from Western and Central China, but known for a much longer period from herbarium specimens, for it was collected by Père A. David in Mupin in 1889 and described by Franchet ("Plantæ Davidianæ," vol. ii. p. 69). It is evergreen, from 1 to 2 feet high, the leaves are ovate, 4 to 6 inches long, $1\frac{3}{4}$ to $2\frac{1}{4}$ wide, with toothed margins; the surface is peculiar by reason of three strong nerves which form an ellipse with a $\frac{1}{4}$-inch margin. The flower buds are set in autumn and remain dormant all winter, to open into moderate-sized white flowers during spring. Being found at an altitude of 8,400 feet, it ought to prove hardy.—*H. R. D.*

Viburnum Henryi (*Bot. Mag.* t. 8393).—China. Family, Caprifoliaceae; tribe, Sambuceae. Shrub, 10-14 feet high, showy in fruit, evergreen leaves, 2-4 inches or even 6 inches long. Flowers, small, pale yellow, densely panicled. Drupes, coral-red at first, at length almost black.—*G. H.*

Viburnum pubescens. By K. Josefsky (*Oestr. Gart. Zeit.* vol. vi. pt. x. pp. 391-2).—*Viburnum pubescens*, a variety of *dentatum*, *V. erosum*, *V. ellipticum* and *V. Demetrionis* are too seldom seen in our gardens.—*S. E. W.*

Viburnum rhytidophyllum (*Bot. Mag.* t. 8382).—Western China. Family, Caprifoliaceae. Shrub or small tree, evergreen. Leaves 4-10 inches long. Flowers, white, $2\frac{1}{2}$-$3\frac{1}{2}$ in. across. Fruit, $\frac{1}{3}$ inch long, at first bright red, ultimately black polished.—*G. H.*

Violet Root-Rot (Maladie du Pied de la Violette). By Et. Foëx (*Ann. de l'Ecole Natt. d'Agric. de Montpellier*, x.; 1910; plate).—A root-rot of violets characterized by having blackish areas in parts of the root and on the portions of the stem below the surface of the soil. The whole plant languishes, the leaves are small and yellowish, and the flowers few in number. It is recommended that the soil should be saturated with a solution of formalin 1 part to 40 parts of water, where plants have been attacked, and that healthy runners only should be used in propagation. The fungus involved is *Thielavia basicola.*—*F. J. C.*

Walnuts without Shell. By Pierre Passy (*Rev. Hort.* p. 567; Dec. 16, 1911).—Description of a variety with laciniate foliage, *Juglans regia* type, with nuts merely protected by a parchment-like skin. Habit of tree like that of the common walnut. Raised by M. Jamin, Bourg-la-Reine.—*C. T. D.*

Watering of House Plants (*Oestr. Gart. Zeit.* vol. vi. pt. xii. p. 468).—Warm water must not be used for watering plants in the house. The temperature of the water should be that of the room in which the plants live.—*S. E. W.*

Watsonia Ardernei. By S. Mottet (*Le Jard.* xxv. 583, p. 168; June 5, 1911; coloured plate).—This lovely plant, the full designation of which should be *Watsonia Mariana iridifolia Ardernei*, has been successfully cultivated in the open air by M. Sanders at Bruges, and by Messrs. Vilmorin. The bulbs only flower well after they have reached their maximal development, unlike those of *Gladiolus*, which flower perfectly from young two-year-old bulbs. They should be planted out at the end of April in a light open soil, with a space of 25-30 cm. between them. They should be watered in the middle of summer, but, contrary to what is often stated, do not seem particularly to require moisture. The chief feature of the flowering spikes is their six to eight lateral ramifications, each bearing some dozen flowers. The central spike flowers first and most abundantly, and the lateral branches develop afterwards. The *Watsonia* is valuable for bouquets and table decoration, on account of its pure white flowers.

F. A. W.

Winesap Thinning, The. By R. S. Herrick (*U.S.A. Exp. Stn., Colorado, Bull.* 170, Nov. 1910; figs.).—The first part of this bulletin brings facts to support the following conclusions:—

1. That thinning the fruit on mature Winesap trees pays in money returns the first year.
2. That the more evenly distributed the fruit on the tree the more uniform will be the size and colour of the crop.
3. That Winesaps will show increased size and better colour even when thinned as late as July 20.
4. That the earlier the thinning can be done the better will be the returns from the fruit sold and the greater will be the vitality of the tree.
5. That the best results are attained on an old tree by leaving the apples from 9 to 10 inches apart.
6. That proper pruning and keeping the trees a proper distance from each other will facilitate thinning.
7. That systematic thinning done from the time the trees first come into bearing will do much to induce regular uniform yearly crops.

The bulletin then proceeds to discuss the various effects of winter and spring frosts upon fruit trees in Colorado, and gives some methods of preventing damage of this sort.

On young apple trees winter injuries are of two sorts—cracks produced by freezing at the ground line and sun-scald, which is more frequent in winter than in summer, especially when there is snow on the ground, from which the sun's rays are reflected on to the trunk. Some method of so piling up the soil in autumn that the snow would not lie in a level plane for any time would probably be useful in preventing scald, and in orchards which are bothered by rabbits, wire-netting extending from the ground-line to the scaffold limbs of the tree would keep off the rabbits, and at the same time break the direct and reflected sun's rays on the trunk. It seems that the darker the bark the more liable it is to injuries from sun-scald. Whitewash,

applied after scraping off all the rough old bark, will answer the double purpose of killing injurious insects and protecting from scald. The following mixture makes a good tenacious wash for the purpose:—

Quicklime	30 lb.
Tallow	45 lb.
Salt	5 lb.

Water enough to make the mixture flow well. Young peach trees are also liable to injury when the temperature falls, as it does in Colorado, lower than 15° below zero, and it is sometimes hard to tell until early summer how much damage has been done, so that after a severe winter it is as well to delay pruning until about May 1, so as to be sure where to prune. Even then peach trees may be so injured as to succumb gradually, months or even a year or two after a severe frost.

The proper management of irrigation is an important matter in preserving young orchards from the effects of low temperatures. Unripened growth falls an easy prey to the first autumn frosts. There is, on the other hand, another form of winter injury among old and young trees alike known as "freezing dry." This is thought to result from two causes—lack of moisture in the soil, and a deeply frozen condition which stops all root action. To prevent this irrigation in late autumn or early winter is necessary. Ice round the base of a tree occasionally results in injury in the form of partial or complete girdling at the ground line, which in some instances is hard to distinguish from the injury due to arsenical poisoning. With peach trees there is always the danger of the fruit buds being nipped by spring frosts. To combat this, there seems great faith in Colorado in the advantages of orchard heaters, either oil or coal, preferably the former.—*M. L. H.*

Wood, Sapstain in. By I. W. Bailey (*Bot. Gaz.* pp. 142-47, Aug. 1910).—The author finds that sapstain in wood is due either to the attacks of fungi or chemical discoloration. The latter is caused by oxidizing enzymes. Hot humid weather is favourable, and cold winter weather is unfavourable to these ferments. These enzymes are destroyed and their action prevented by a temperature of 100° C. Treating sapwood of alder, birch, and cherry with boiling water destroys them and prevents the sapstain. Treating sap lumber in long tanks of boiling water appears to be a practical method of preventing this discoloration adapted to saw-mill practice.—*G. F. S. E.*

Yucca Whipplei (*Gard. Chron.* p. 106; Feb. 17, 1912; 2 figs.).—A record of the flowering of Yucca Whipplei at Aldwick Manor, Bognor, in the summer of 1910 in the open, after living out with winter protection for 6-8 years.—*E. A. B.*

Zygopetalum Mackayi Charlesworthii (*Gard. Chron.* p. 83, Feb. 10, 1912; with fig.).—An albino form, with no purple markings on *P. tomentosum*. The plant is sterile so far.

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Part II.

TENDER PLANTS FOR A WARM CORNER.

By R. Irwin Lynch, M.A., V.M.H.

[Read April 2, 1912; Sir J. T. D. Llewelyn, Bt., V.M.H., in the Chair.]

I. Introduction.

This is a subject of some novelty, perhaps, and I would therefore point out that it concerns the cultivation of a great variety of tender plants in the open air, under such conditions that they often succeed much better than in plant-houses and can always be seen to better advantage. It concerns also the saving of valuable space in plant-houses.

We all know that the largest plant-house never contains all we want to grow in it. If then we can grow some of our tender plants in warm corners out of doors it practically equals an extension of our plant-houses. Space is saved for much that cannot be grown out of doors, and two blades of grass may be said to grow where one grew before. Yet the strongest argument, perhaps, for the cultivation of tender plants under suitable conditions out of doors is evident in the fact that they often attain a much finer development than is possible under glass and with far less trouble. It must be remembered, too, that by utilizing our warm corners out of doors we may cultivate, if we wish, a host of ornamental and interesting plants that we could not expect to provide space for under glass. The very capacity of the garden itself is enlarged.

All these considerations raise one question—What tender plants can be, or ought to be, grown out of doors, and what are the conditions under which they will succeed? The answer to that question, so far as time allows, I have now to give, and I am sure you will be astonished

at the number that can be well grown outside, instead of inside, the plant-houses in which they might be expected to be contained.

It may be interesting to mention that for many years experiments have been made in the Cambridge Botanic Garden which help to answer the question, and it is not too much to say that the tender plants growing out of doors would require, if grown under glass, quite the largest of our plant-houses or even more than that, so that much space is saved. Such experiments are not exclusive to Cambridge, but there is always the possibility of something new or different or fresh in application, and I think that Cambridge has done something to illustrate the way to utilize the shelter and warmth naturally provided by plant-houses, and especially how to succeed with such groups, for instance, as the so-called hardy Cacti. These have been a feature for some years, and other natural groups of some particular interest are the Zingiberaceae or Ginger family, and the Bromeliaceae or Pineapple family. Certain particular plants too, the results of trial, have been noteworthy. I may mention that *Gerbera Jamesoni* planted against the south wall of a stove behind Cacti had leaves 2 feet long and flower stems 3 feet high, with flowers 4½ inches across, in the early days of its cultivation, when it was considered difficult to grow.

All the warm corners at Cambridge are included within what I may term the Riviera region of that garden. It is formed by the plant-houses. We have first of all a corridor over 90 yards long and 16½ feet high running east and west. Opening out from this corridor on the south side are the plant-houses, each one 9 feet apart from its neighbour. There is thus protection from the north by the corridor, and protection from east to west, for recesses and spaces between the plant-houses, by the houses themselves. All the front of the range is open to the south. There is in winter the important factor of warmth from the plant-houses, especially those that have four hot-water pipes on the inside of the walls. These pipes, I believe, keep the narrow borders next the walls from sinking to a very low temperature, and of course protection can be given in various ways. Even a slight amount of shelter and protection sometimes makes a great difference. Whether a plant is tight against a wall or only a few inches away from it may be of consequence.

During severe weather in winter mats are used to protect the more tender shrubs that are planted against walls or glass, and light litter is effective for lower growths. Nothing is more suitable than bracken, for it does not readily sink into a wet mass. All protection should be as dry as possible. For the purpose of keeping off wet, movable lights are used over the Cacti, the Caper plant, and a few others. Mats in front of the more tender Cacti, like *Opuntia robusta*, afford still further protection to them. Ashes are quite satisfactory over bulbs, tubers, and rootstocks at rest, but care must be taken to remove them before much growth takes place. Anything wet or rotting makes a very bad protection.

II. Tender Plants in the Open at Cambridge.

Among the principal plants growing in warm corners at Cambridge are the following:

Bromeliaceae:

Dyckia remotiflora flowers freely, producing spikes of orange flowers.
D. brevifolia.
Greigia sphacelata.
Rhodostachys andina.
R. littoralis.
R. pitcairniaefolia (*Bot. Mag.* t. 8087).
Puya chilensis (fig. 63).

All these are covered overhead with glass in winter and flourish without difficulty. The *Puya* is 6 feet in height and 6 feet through. It bears a considerable amount of cold and appears to grow during mild weather in winter. In autumn it showed signs of branching and by the middle of April had four new crowns fully formed. All are Chilian with the exception of the two Dyckias, which are Brazilian.

Cactaceae:

Echinopsis Eyriesii (*Bot. Mag.* t. 3411).—This is the most satisfactory of the globular Cacti. It has a beautiful white or pale pink flower, with tube 9 inches long—a length greater than the height of the plant.
Opuntia arborescens.
O. arborescens major.
O. bicolor.
O. brachyarthra.
O. cantabrigiensis, 12 feet wide, 6 feet through, 3 feet in height.
O. cymochila.
O. elata.
O. fragilis.
O. glaucophylla.
O. humilis.
O. monacantha, 3 feet in height, 6 feet wide, and 2 feet through.
O. robusta, 5 feet in height, 7 feet wide, 4 feet through, with joints 12 inches and even 14 inches in diameter.
O. Rafinesquii.
O. xanthostemma.
O. vulgaris.

The best of these for flowering are *O. bicolor*, *O. monacantha*, and perhaps *O. xanthostemma*. *O. robusta* is finest in growth, but the most tender. *O. cantabrigiensis* is the freest and hardiest of all.

Among other succulents are *Echeveria Purpusii*, *Agave Parryi*, and *A. utahensis*. The latter *Agave*, however, is certainly hardy. *Beschorneria yuccoides* (fig. 64), native of Mexico, may be added. It is allied

to the Australian *Doryanthes* (see *Gard. Chron.* July 3, 1910), and has a similar habit. It lived in the narrow border of the Cactus House.

ZINGIBERACEAE:

Cautlea lutea, Himalaya.
Hedychium flavescens, Himalaya.
H. angustifolium, India.
H. Gardnerianum, Himalaya, Nepal, Sikkim.
H. Sadlerianum, hybrid.
Roscoea purpurea, Himalaya.
R. purpurea, var.
Zingiber Mioga, Japan.

All these are very satisfactory on borders against the Tropical Fern House and Palm House. *Zingiber Mioga*, though well established, has not yet flowered. All the others flower freely and are quite effective. Alpinias are worth trying.

The following shrubs are grown in a similar position:

Abutilon vexillarium (*Bot. Mag.* t. 5717), Trop. America.—This and the variegated form are excellent for plant-house walls, if trained and not allowed to get bushy.

Berberis Fremonti, Texas and Arizona.—This is said to be hardy, but certainly it benefits by being planted against the Cool Fern House. The shrub is ornamental with glaucous leaves. *B. Fortunei* does not succeed in the open, but with slight shelter does well.

Caesulpinia Gilliesi, South America.—Has succeeded against the wall of the Cactus House. Specimens in flower have been sent me from Devonshire. *C. japonica* does not succeed in the open, but grows strongly between the Palm House and Tropical Fern House.

Camellia Sasanqua, Japan and China.—The double white growing against the wall of stove, but not trained close to it, has been exceedingly beautiful, flowering freely in late November and early December. The single red has also been ornamental. *C. japonica*, flowering in late April, under similar circumstances has also been good. The single red, named 'Jubiter,' has been very handsome.

Capparis spinosa (*Bot. Mag.* t. 291), Caper-plant.—The beauty of this plant is known to few. Planted against the wall or corridor it spreads to about 6 feet across in summer, and flowers freely, if not encroached upon. In winter it dies back and is covered with a light to keep off wet.

Carpenteria californica.—A well-known Cistus-like shrub allied to *Philadelphus*.

Ceratonia Siliqua, South Europe, North Africa, and the East.—A small evergreen leguminous tree, suitable for a plant-house wall. Its flowers have no corolla. It is a plant of interest on account of the value of the pods for feeding purposes. They are probably the husks mentioned in the Parable of the Prodigal Son.

Cocculus laurifolius, Himalayas and Japan.—For several years this has lived in a sheltered corner. It cannot flourish for want of room.

Convolvulus Cneorum, South Europe.—Quite tender, but easily protected. Its silvery leaves and creamy-white flowers make it worth growing.

Coriaria myrtifolia, Mediterranean region.—Foliage very graceful. Coriarias are ornamental on account of the semblance of fruit formed by the fleshy petals.

Corokia Cotoneaster, New Zealand.—A small shrub, quaint, with small leaves and small yellow flowers, belonging to the Cornaceae.

Coronilla glauca, Mediterranean region.—A very pretty free-flowering species growing on wall of stove for several years. In the Isle of Wight I have seen it on the mullions of cottage windows.

Cydonia sinensis (*Bot. Mag.* t. 7988), Chinese Quince.—Has grown freely against side of Temperate House, but has not flowered. The leaves are ornamental in autumn, turning brown and red. The fruit is large and fragrant, and is said to be used for scenting tea and flavouring wine.

Dasylirion glaucophyllum (*D. glaucum*), Mexico.—Has lived in angle formed by Aquarium and Palm House, with slight protection, for some years.

Deeringia celosioides variegata, Asia.—This shrubby Amaranthad is pretty for a plant-house wall.

Drimys Winteri, Straits of Magellan and Chile.—A fine evergreen shrub of the family Magnoliaceae. It flowers profusely in May, and planted against the side of the Palm House requires only a mat in winter. The flowers are pale creamy-yellow (fig. 65).

Edwardsia microphylla, New Zealand Laburnum.—The branches are very flexuous and leaves small. Hardy in Devon and Cornwall.

Eriobotrya japonica, Japan, Japanese Medlar or Loquat.—Against corridor grows strongly and makes fine foliage, but does not fruit. Is easily fruited if starved in a pot.

Erythrina Crista-galli, Brazil.—A very fine red-flowered leguminous plant. It is sometimes grown with glass overhead, but here it does well against wall of Palm House, protected with ashes and light litter in winter.

Eurybia stellulata, Australia.—This is now referred to *Olearia*, and is a very pretty small shrub, with numerous starry white flowers.

Fabiana imbricata, Peru.—A very charming shrub, hardy in Devon and Cornwall, and safe through all mild winters in Cambridge, but deserving a warm corner. It has a very heath-like appearance both in foliage and in its numerous white flowers (fig. 66).

Fatsia (*Aralia*) *japonica*, Japan.—Planted in the shelter of Museum buildings this is almost as good as in the Isle of Wight.

Fendlera rupicola (*Bot. Mag.* 7924), Texas and New Mexico.—An exceedingly beautiful ally of *Carpenteria* and *Philadelphus*, flowering profusely against the south wall and glass of the Cactus House. It grows on hot rocks, and, though hardy, appears to require a position of this kind.

Fremontia californica, California.—A very ornamental ally of the

Hand-plant (*Cheirostemon*), but with very different flowers. They are yellow, shaped like a saucer, of considerable size, and produced very freely. It is a fine plant for a wall. I believe it may die from other causes than low temperature, but it should have the protection of mats in severe weather (fig. 67).

Fuchsia Colensoi, New Zealand; *F. excorticata*, New Zealand; *F. recurvata*, South America (?); *F. exoniensis*, garden hybrid; *F. corallina*, garden hybrid. These and others are very suitable for a warm corner. *F. gracilis* and *F. Riccartoni* do not require it.

Helichrysum diosmaefolium (*H. rosmarinifolium*), Australia.—A very profuse flowering shrub, succeeding well in a warm corner through ordinary winters, but sometimes killed. The flowers are white.

Ilex latifolia, Japan.—The largest leaved and finest of all the Hollies. Does well with slight shelter or protection.

Indigofera alba, China.—A rare and beautiful species, flourishing against wall of stove.

Lippia citriodora, 'Lemon-scented Verbena,' South America.—Suitable for wall of plant-house.

Mitraria coccinea, Chiloe.—A charming small shrub, with tubular scarlet flowers, of the family Gesneraceae. Has lived out of doors for several years on a north border close to wall of a building. Has neither grown nor flowered freely, but would probably do so in a truly "warm corner."

Myrtus Luma, Chile.—Has suffered, but has lived in its corner with 17° of frost in the open. *M. communis*, Western Asia, naturalized in Southern Europe.—Grows well between Palm House and stove and in angle formed by Palm House and Aquarium.

Nesaea grandiflora (= *Heimia*).—This is referred to *N. salicifolia*, a native of tropical America, but it is much finer as a garden plant. It does well against the wall of Palm House.

Nolina erumpens, Texas.—A very interesting plant, with hard narrow leaves, allied to *Dasylirion*, but not in this position, at any rate, producing a stem above ground. It succeeds well with slight protection close to wall of Cactus House.

Olea europaea, Olive, Mediterranean region and the East.—In angle formed by Temperate House and corridor it succeeds well.

Prunus (*Cerasus*) *ilicifolia*, California.—This evergreen cherry has grown well against Tropical Fern House, but has never flowered. Growing too large, it is now cut down and may be described as interesting only.

Rhaphitamnus cyanocarpus, Chile.—A beautiful tree, with evergreen leaves, pale blue flowers, and bright blue fruits. It is just a little too tender for best results in this country. Here it grows against the wall of the stove, but it was injured during the past mild winter. I remember a tree of some size at Menabilly, in Cornwall, but it struck me as not quite happy.

Ribes speciosum, California.—This is perhaps the most beautiful

species of all. It has crimson flowers, with long projecting stamens, wreathing the branches and suggesting to many the genus *Fuchsia*. It is hardy, but only in a warm corner can it do justice to itself, so far as I have observed. At Hampton Court some years ago there was a beautiful specimen on a wall, and it amply justified the position.

Romneya Coulteri, California.—Must have a considerable degree of hardiness. Here planted against the wall of stove is perfectly safe, and can be made to flower splendidly. It is liable to be too much crowded with growth and to require thinning.

Rosa bracteata, China.—A very fine Rose, usually regarded as requiring a wall, which it well deserves. Here it does not do well, and I suspect is too much sheltered from rain. *R. Banksiae*, China.—Described by Lindley as the most elegant of the genus; this Rose in its double and best yellow form demands a place in every garden. It will do well on the wall of a house, and where I have it I do not think it has ever been injured by winter cold. When in growth spring frosts may do harm.

Salvia Grahami, Mexico.—Has succeeded well for many years against a wall at Cambridge.

Solanum crispum, Chile.—A shrub with very potato-like flowers, but quite ornamental. At Cambridge it needs only a wall.

Thunbergia natalensis, South Africa.—Though described as a climber, this, as it grows in Cambridge, has precisely the habit of *Fuchsia*, dying down the same way in winter. It grows about 2 feet high and bears numerous flowers of delicate lilac colour with yellow eye. An experiment showed some years ago that it would grow and flourish in the narrow border of the Cool Fern House (fig. 68).

Trachycarpus excelsa (= *Chamaerops Fortunei*), India, China, and Japan.—A well-known Palm, readily grown in the open in Devon and Cornwall. Here it is doing well in an angle formed by the Palm House and Aquarium.

Tricuspidaria Hookeri (*Bot. Mag.* t. 7160), Chile.—A very beautiful plant, with red, somewhat globular, flowers. Has withstood 17° of frost, but evidently requires a more genial climate than that of Cambridge.

Umbellularia californica.—Under this name we now find the old *Oreodaphne californica*. It requires no more than the protection of a wall. Its strong smell is said to cause headache, but the Spanish-Americans use the leaves as a condiment. It is a handsome evergreen, and among other names is known as the 'Sassafras Laurel.'

Veronica.—The borders against the Temperate House and Cool Fern House, and sheltered by them, are devoted to a collection of the New Zealand species of this genus. All are more or less shrubby, and thus stand in remarkable contrast to European species. It would be impossible to enumerate them all, but attention may be drawn to:

V. amplexicaulis, erect or decumbent, 1 to 2 feet high, with leathery sessile leaves and sessile white flowers in short spikes.

V. anomala, an attractive slender shrub, with deep green polished leaves and white flowers in short terminal panicles.

V. Balfouriana, a very neat shrub, 3 feet high, characterized by purple stems and dark green leaves, with racemes of violet-blue flowers.

V. carnosula, a low-growing species, with leathery glaucous leaves and white flowers.

V. cupressoides, cannot be omitted from any set, but it is not very tender. It closely resembles a Cupressus in the twigs, and has small heads of sessile flowers on the tips of the branchlets.

V. Hectori, like *V. lycopodioides*, is strongly suggestive of *Lycopodium*; the flowers are white, with purple anthers, and grow in small terminal heads.

V. Hulkeana.—Quite the most beautiful of New Zealand Veronicas in my opinion. It is somewhat erect in habit, and grows about 2 feet high, producing numerous large panicles of the most delicately tinted lilac or mauve flowers. Distinctly tender, but survived last winter on the Rockery.

V. lycopodioides, the appearance of the plant is aptly indicated by the name; the flowers are white in small terminal heads.

V. parviflora (*angustifolia*), forming a small shrub and having narrow leaves, with spikes of small white flowers. It is useful as flowering late, even in December.

V. salicifolia, a strong-growing kind, with spikes of white flowers; against the side of corridor it grows about 8 feet or more high.

Differing from all these, but cultivated with them, is the Australian *V. Derwentia*, herbaceous in habit, and almost European in appearance.

Viburnum odoratissimum (*V. Awabuki*), Khasia Mountains and China.—A very fine evergreen shrub, with large, very glossy olive-green leathery leaves. Flowers are not often produced, but they are very sweet scented. Does well, growing about 8 or 10 feet high in an angle formed by Palm House and Aquarium.

The climbers grown at Cambridge are:

Clematis aphylla, New Zealand.—A rare curiosity. It has almost leafless green stems and very small green flowers. It is planted against the Succulent House, and flourishes with slight protection. *C cirrhosa*, Mediterranean region.—Is said to flower all winter in a greenhouse; in the South of England it is hardy. Evergreen. The flowers are white or creamy-white, spotted with purple. Is often known as *C. balearica*. Planted against end of corridor, it is the earliest of all Clematises, flowering at the end of March or beginning of April.

Cucurbita foetidissima (*Cucarnis perennis*), Mexico.—Has been striking, with its large greyish leaves, growing against Palm House for some years. In the Jardin des Plantes, Paris, I have seen it very ornamental, spreading on ground. It is diœcious.

FIG. 63.—PUYA CHILENSIS AT CAMBRIDGE. (*Gard. Chron.*) (p. 191.)

[*To face p.* 196.

[Photo: E. J. Allard.

FIG. 64.—BESCHORNERIA YUCCOIDES AT CAMBRIDGE. (*Gard. Chron.*) (p. 191.)

FIG. 65.—DRIMYS WINTERI.

Fig. 66.—Fabiana imbricata.

Holboellia latifolia, Himalaya.—An evergreen climber of the family Berberidaceae, with ternate or quinate leaves, allied to *Akebia*. Stands well against Cactus House. Sometimes known as *Stauntonia*.

Ipomoea Purga, Mexico.—The plant yielding the drug Jalap. Growing against Palm House this is sometimes very ornamental, with its numerous large purple flowers. During the past hot summer it grew freely but did not flower. A perfect perennial in the above position.

Jasminum primulinum, Western China.—Has grown on an east wall for some years, and might be good with careful treatment.

Mutisia decurrens (*Bot. Mag.* t. 5273), Chilian Andes.—This is a well-known choice climber, producing fine orange flowers 6 inches across. It has done fairly well against the east side of Palm House. It is best increased from seed, which I believe may be obtained most successfully by crossing different plants.—*M. ilicifolia*, Chile.—Differs considerably from *M. decurrens*, but is well worth growing. The flowers are white or rosy-red. It used to grow at Reigate in Mr. Wilson Saunders' garden on a stick in the open. Treated like *M. decurrens* it should be quite safe.

Rubus australis, New Zealand.—One of the most curious of the genus. The leaflets are either absent or are reduced to mere points, while the petioles and petiolules are apparently increased in length. The entire plant is covered with small prickles. Does well against Palm House.

Smilax aspera, 'Prickly Ivy,' South Europe.—An attractive small and very densely growing species, very dark in colour, and often spotted. This and *S. rotundifolia* both grow against the Temperate House. The genus *Smilax* is interesting as alone possessing tendrils which are formed from stipules.

Herbaceous plants growing in warm corners at Cambridge include:

Amicia Zygomeris, Mexico.—An interesting, rare, and pretty plant, in summer reaching a height of 6 feet, and quite at home in an angle formed by stove and corridor. It is leguminous, with pinnate leaves, the leaflets exceptional in their obcordate or cuneate-emarginate form. Is most remarkable in the large stipules which protect the unfolded leaves.

Calceolaria Sinclairi (*Bot. Mag.* t. 6597), New Zealand.—Is perfectly safe, apparently, planted in narrow border against Cool Fern House. It belongs to the same section of the genus as *C. violacea*, a native of South America, the home of the genus. It has a two-lipped corolla of pale-lilac within, spotted with red-purple. A pretty and choice plant. Several other kinds only require a similar position.

Iris hexagona (*Bot. Mag.* t. 6787), Southern United States.—A fine but somewhat tender Iris, doing well in the angle formed by Palm House and the Aquarium. *I. unguicularis* (*I. stylosa*), (*Bot. Mag.* t. 5773), native of North Africa, though hardier profits by the same position.

Jaborosa integrifolia, Argentine.—Is an interesting plant, with

creeping underground stem, flowers like those of *Nicotiana affinis*, and oval leaves. It grows well in narrow border by Orchid House, but cannot live in the open.

Lobelia laxiflora, Mexico and Central America.—In a border against corridor between two houses this is perfectly at home. It is not unlike *Siphocampylos bicolor.*

L. Tupa (*L. Feuillei*) Chile.—A fine plant, with red flowers, not more than half-hardy. Against the wall of the stove it does well.

Nierembergia rivularis, La Plata.—Is said to be hardy, but in Cambridge it succeeds only in a border close to plant-houses.

Oxalis floribunda, Brazil.—Having woody stems above ground, this cannot be classed with the species to be mentioned in next section. It is usually grown as a greenhouse plant. Here against the wall of the Tropical Fern House it has flourished for a number of years, and is very floriferous and showy. The white variety is also charming.

Pelargonium Endlicherianum, Taurus.—This pretty species is nearly hardy; against the wall of Tropical Fern House it flourished for some years.—*P. triste*, South Africa, is a very curious species, with decompound leaves and blackish-yellow flowers, proceeding annually from a woody rootstock. It has lived for many years against wall of Tropical Fern House.

Priva laevis, South America.—A low-growing Verbenaceous plant, with lilac, very sweetly scented flowers. Nearly, if not quite, hardy.

Rehmannia angulata (*Bot. Mag.* t. 8177), China.—Has lived through 17° of frost in border by Palm House, flowering beautifully in June. A very fine plant for outdoor cultivation where it can live.—*R. glutinosa, China*, is not so ornamental as the last, but is hardier. It has lived for many years in the border of the stove.

Bulbous and tuberous plants receiving similar treatment at Cambridge are:

Agapanthus intermedius, *A. Moorei*, *A. umbellatus*, all from South Africa, have sufficient hardiness to do quite well in borders between the plant-houses.

Amaryllis Belladonna, Cape Colony.—The only true Amaryllis, and one of the most beautiful of bulbs. It makes a great show along the foot of the south wall of the Orchid House. There are several forms, and variations in colour may be obtained from nearly white to deep rosy-red. It is often a feature in the gardens of Devon and Cornwall, and can be grown well at least as far north as Cambridge (fig. 69).

Anoiganthus breviflorus, Natal.—Of the same family, this is very different from the last, but grows with it under precisely the same conditions. It has yellow flowers.

Antholyza paniculata, South Africa.—Nearly, if not quite, hardy. Useful as growing readily and not requiring much protection.

Bowiea volubilis, South Africa.—One of the most curious of bulbs. The leaves may not be developed for years. Their place is taken by abortive peduncles which recall those of *Muscari comosum mon-*

strosum. The scape is twining and bears green flowers. It has lived for many years against the foot of Palm-House wall.

Bravoa geminiflora, Mexico, is a very graceful Amaryllid, with inflorescences and flowers recalling those of *Pentstemon* (*Chelone*) *barbatus.* A very pretty plant, quite at home against wall of stove.

Commelina coelestis, Mexico.—A tuberous-rooted species, with very charming perfectly blue flowers. It has lived for some years in the Orchid House border.

Cooperia pedunculata, Texas.—Allied to *Zephyranthes.* Flowers white.

Crinum.—This genus affords a very fine feature occupying the greater part of the bay formed by Tropical Fern House and Tropical Orchid House. The following are very fine:—*Crinum Colensoi*, under which name I have a superior ally of *C. longifolium*; *C. longifolium*; *C. longifolium album*; *C. Moorei* [The plant usually grown under this name was cultivated many years at Kew before the name was applied to a dark form from Glasnevin, figured in the *Botanical Magazine.* It was known as *C. MacKenii*, now counted a synonym]; *C. Powellii*; *C. Powellii album*, a very beautiful form; *C. Van Tubergeni*, one of the finest of Crinums. I have also out of doors *C. Schimperi* and *C.* 'H. J. Elwes,' a hybrid between *C. americanum* and *C. Moorei.*

**Dierama pulcherrima* (=*Sparaxis pulcherrima*), Cape Colony.—A most beautiful and graceful Irid. At Mount Usher, in Ireland, I have seen it in splendid form, from white to dark-purple, growing 6 feet high. It does fairly well in the border against the stove-house.

Eucomis punctata, Cape.—A quaint liliaceous plant, with fresh, bright green foliage, and erect spikes of green flowers surmounted by a tuft of green bracts; nearly hardy.

Haemanthus albiflos, South Africa.—This is not a showy species, but merits notice from the persistency with which it has lived by the Palm-House wall.

Hippeastrum bifidum, Buenos Ayres.—An insignificant plant compared with the last. Is interesting and pretty.

Hippeastrum pratense, Chile.—A magnificent bulb, with large flaming-red flowers. It is hardy, but I mention it here as it benefits by a hot, sunny position.

Hymenocallis Harrisiana, Mexico.—Has flowered for many years past in borders of Palm-House and stove. It is very ornamental with white flowers (fig. 70).

Ismene calathina, Peru and Bolivia.—This is now referred to *Hymenocallis.* It has strong foliage, 2 feet long. The flowers are large and white, with green tubes. It flourishes against the wall of the Tropical Fern House.

**Kniphofia caulescens*, South Africa.—In an angle formed by the Aquarium and Palm House this flourishes and extends over the walk. In flower it is a fine feature. Here also is *K. Northiae* and *K. Tuckii*,

and on another border are several others of the more tender members of the genus.

Oxalis.—Many South African and no doubt other tuberous species can be grown in the narrow borders at the foot of hot-house walks. *O. purpurata* (=*O. Bowieana*) is one of the finest. *O. incarnata* is good, so also a plant I have known as *O. rosacea*, which makes a charming edging in flower. *O. Smithii* is choice but rare.

Lapeyrousia cruenta, Cape Colony.—This is the old *Anomatheca cruenta*, a charming Irid, with bright red flowers. It comes up from seed and can be one of the most attractive of weeds. *L. grandiflora*, from Delagoa Bay, is, I believe, rather hardier than the last. It succeeds well in the plant-house borders.

Lycoris squamigera (*Bot. Mag.* t. 7547), Japan and China.—In colour and habit this resembles *Amaryllis Belladonna*. It is a very fine bulb and flourishes against the south wall of Palm House. In the same position also are *L. Sprengeri* and *L. incarnata*.

Pancratium illyricum and *P. maritimum*, South Europe.—Nearly, if not quite, hardy, but in any case do well against a plant-house wall.

Sauromatum guttatum (*Bot. Mag.* t. 4465), Himalaya.—Sold as 'Monarch of the East'; this is the tuber offered to produce its flowers without soil on a mantelshelf. It is an Aroid of considerable interest and beauty, and does well in the border by Tropical Fern House, flowering freely in May.

Schizostylis coccinea, South Africa.—A very showy Irid, with crimson flowers produced in winter. It will succeed on any warm border, but for the protection of its flowers glass is desirable. It is known as 'Crimson Flag' and 'Kaffir Lily.'

Sprekelia formosissima (*Bot. Mag.* t. 47), Mexico and Guatemala.—The 'Jacobea Lily,' well known for its splendid crimson-red flower. Here it grows rampantly on the east border of the stove, but does not flower. At Kew I have seen it flowering, and probably it requires a more sunny position. There is a white variety in cultivation. The type is one of the best of pot bulbs.

III. Recommended for Trial.

Owing to limited means the following with one or two exceptions have not been tried at Cambridge:

Nelumbium speciosum (*Bot. Mag.* t. 3916), Sacred Lotus. North Africa, Asia.—In an ordinary pond at Bagatelle in the Bois de Boulogne, on the west side of Paris, this magnificent aquatic has grown and flowered for several years in an astonishing way. Since the climate of Paris is not exceedingly different from that of London, it is impossible to believe that it could not succeed in some warm corner of these islands. It is not winter cold that prevents success, since it grows in Siberia in lakes where ice is thick every winter, but difficulty rather rests in the need of a hot summer. For a limited time it did succeed, I believe, in Dorset, and as one of the most characteristic and beautiful of plants is worth trial. The rhizomes

must be as well ripened as possible, and must not be frozen in winter. At Bagatelle, by way of great precaution, artesian-well water is run in during severe weather in winter, but it is held that the rhizomes are safe if they are not frozen. *N. luteum* is said to be still hardier.

Fruits.

Citrus medica.—In Devon and Cornwall I have known Citrons splendidly grown on south walls quite without heat, and only with a covering of glass lights in winter. I draw attention to this because other fruits can no doubt be grown equally well in the same way. Near Falmouth, I am informed, the Citron grows and fruits on a wall without any further protection. With top glass protection in winter both Citrons and Lemons are grown successfully near Ilfracombe. Near Plymouth, on a wall, the Citron fruits splendidly, and the only protection it ever gets is Frigi-domo canvas. Close to it an Orange grows quite in the open, but it has been injured, though probably the damage was done more by salt winds than by frost.

Asimina triloba, North American Papaw.—Good varieties of this have been found wild, and some have been obtained by selection. Professor Foex considers this an important fruit. It is quite hardy at Cambridge, and flowers freely, but does not fruit. It ranges south to Mexico, and may at some time require more heat. In Mexico it is known as 'Ahonillo.'

Citrus Aurantium, Orange, Tropical Asia.—At Coombe Royal, near Kingsbridge, Devon, I have seen oranges flourishing on walls like peaches. They should succeed where the Citron succeeds. In the Journal R.H.S., xxxviii. (1912), p. xxxiii., attention is drawn, with a figure, to the 'Satsuma' or 'Oonshin' Orange, one of the hardiest. The hybrid with *Citrus trifoliata* grows in the open at Bitton.

Cydonia sinensis, Chinese Quince.—Has been mentioned as growing at Cambridge, but as a fruit requiring a warm corner may be mentioned again.

Feijoa Sellowiana (*Bot. Mag.* t. 7620), South Brazil and Uruguay.—"The coming fruit for all parts of California;" it is allied to Guava, and not unlike in habit and foliage. The flowers are red and white and very ornamental. The fruit is green, two inches long, and fragrant. It grows well on a wall at Kew. I am informed that from its poor success in the south of Europe it is not likely to succeed as a warm-corner fruit in this country. With Canon Ellacombe at Bitton it has succeeded during the last three years as a shrub some distance from a wall.

Diospyros Kaki, Persimmon or Japanese Plum.—This grows perfectly on a wall near Newmarket, but does not flower. It can bear much more cold than a Citron, and ought to succeed well where the latter succeeds. In the United States the Lamopan Persimmon is expected to succeed under conditions that are not good enough for other kinds. It appears to be a good kind, succeeding as far north as Pekin (see *Year-book, U.S.A. Dep. Agr.*, 1910). Persimmon

succeeds well in the cool end of the Cactus House at Kew, and has flowered this spring at Cambridge. At the time of writing the fruit is swelling fast. It fruits excellently with Canon ELLACOMBE at Bitton.

Punica Granatum, Pomegranate, North Africa, West Asia.—I have seen this fruiting on the side of a house in East Cornwall; it has fruited at Henley-on-Thames, and should fruit generally without much assistance. The double form flowers on my house at Cambridge, and for some years a stool of it grew in the open, quite without protection, dying down in winter and coming up in spring like a Fuchsia.

FINE-FOLIAGED PLANTS.

Cocos leiospatha, Brazil.—Said to be the hardiest of the genus. This failed at Cambridge after a struggle of about three years. It had not a very good chance, and with its ally, *C. australis*, might succeed in a warm corner in Devon or Cornwall.

Cordyline australis, New Zealand.—This can live easily out of doors during some winters at Cambridge without protection. In Scilly and in Ireland it is sometimes a fine feature.

Dicksonia antarctica, East Australia and Van Diemen's Land.—This fine tree-fern can bear a considerable amount of cold, greater than that experienced by some parts of these islands.

Erythea (*Brahea*) *edulis*, Guadalupe Island.—Is said to stand $21\frac{1}{2}°$ of frost, and where that never occurs it should be worth trial. *E. glauca*, which stands 18° of frost, might also be tried.

Fatsia papyrifera, Rice-paper plant, China.—A feature at Scilly. This might succeed in a very favoured locality where there is little frost.

Jubaea spectabilis, Chile.—A fine specimen once existed near the main walk in front of No. 1 House at Kew, near the principal entrance. It may have been killed by cold, but in the more favourable localities of Devon and Cornwall it is well worth trial. It is sometimes seen on the Riviera.

Melianthus major, Cape.—Is said to live out of doors in favoured parts of Scotland. It is certainly worth trial.

Musa japonica (*M. Basjoo*), (*Bot. Mag.* t. 7182), Liu-Kiu Archipelago, has the habit and general character of the Banana. It is cultivated in South Japan for its fibre, and grows satisfactorily in sheltered places of Messrs. Veitch's Nursery at Coombe Wood, near Kingston, and ought to succeed, with fine ornamental effect, in parts of Devon and Cornwall.

Nandina domestica, China and Japan.—A very graceful and ornamental Berberid, with decompound leaves on slender stems 5 or 6 feet long. Nearly hardy.

CLIMBERS.

Clianthus puniceus (*Bot Mag.* t. 3584), Parrot's Bill, New Zealand.—Has flourished under wall of a window in Cambridge during the last four years, flowering freely this spring. I have seen it

covering the side of a house near Plymouth, and it is said to succeed at Hunstanton, on the Norfolk coast, and in the Isle of Man. The Cambridge plant above referred to is covered with sacks during severe weather in winter. One of the finest climbers that can be grown.

Convolvulus Scammonia, Scammony, Asia Minor.—I have known this succeed well on a south wall. The name is more common than the plant. It has creamy-white flowers and glaucous foliage. A beautiful plant.

Ficus stipulata. China and Japan.—This and its small form known as *F. minima*, is much hardier than is usually supposed, and should be tried out of doors in mild districts.

Lapageria rosea, Chile.—In Ireland I have seen this doing well, and no doubt it succeeds in Devon and Cornwall, but often it exists only where it is tried out of doors, and does not flourish. In a greenhouse it is sometimes difficult and capricious. The white variety, like the type, is exceedingly beautiful.

Mandevilla suaveolens, Buenos Ayres.—Was grown by the late Mr. Ewbank on the walls of St. John's Church, at Ryde, in the Isle of Wight. A very beautiful white-flowered climber.

Trachelospermum jasminoides, Shanghai.—With dark evergreen leaves, it bears a profusion of white flowers. It succeeds on a south wall. At Kew it once happened to be in stove greenhouse, and on wall of "New Range," and seemed to flourish equally well in each position.

Tropaeolum pentaphyllum, Buenos Ayres.—A graceful species, with digitate leaves, dull purple calyx, and bright vermilion petals. Is said to be half-hardy. I have known it grown in a recess outside a greenhouse in Cambridge.—*T. tuberosum*, Peru.—Has tuberous roots, which are edible when boiled. It is a handsome species, with peltate leaves and yellow and red flowers. Succeeds well against the corridor if the roots are taken up and stored during the winter.

Solanum jasminoides, Brazil.—A beautiful climber in Devon and Cornwall, but capable of flourishing further north, since at Kew I have known dense masses on a south wall.

Flowering Shrubs.

Acacia.—In Scilly I remember a fine tree of the beautiful *A. dealbata*. In *Irish Gardening* it is stated to have grown 50 feet high in three years near Bray. Near Plymouth various kinds have been grown on walls, among them being *A. armata* and *A. verticillata*. In the warmer parts of Ireland *A. armata* can be grown in the open. *A. Riceana* is grown on a wall near Exeter, and produces very fine sprays. Is slightly protected.

Abutilon vitifolium (Bot. Mag. t. 4227), Chile.—I have failed with this on the side of my house, but in Cheshire the white variety covering the side of a house a few years ago was one of the most beautiful sights I have seen. At Mount Edgcumbe, near Plymouth, it is practically naturalized, and is quite hardy there.

Coprosma Baueriana, New Zealand.—The fine evergreen foliage of this plant makes it very ornamental on a wall, while the variegated variety, useful in the same position, is one of the prettiest things of its kind.

Dendromecon rigidum (*Bot. Mag.* t. 5134), California.—A very choice Papaverad, with numerous yellow flowers 2 inches across, and lance-shaped leaves 2 inches to 4 inches long. It succeeds well on a south wall at Kew, and is one of the many important discoveries of David Douglas.

Desfontainea spinosa (*Bot. Mag.* t. 4781), Chile to New Grenada.—With the habit and foliage of a small holly, the flowers are tubular and scarlet with yellow limb. Is described as hardy, but from my experience I should call it tender. I believe also it dislikes lime in the soil. It does well in Devon, and is a very striking shrub.

Embothrium coccineum (*Bot. Mag.* t. 4856), South America.—The orange-scarlet flowers make this one of the finest of shrubs in certain favoured gardens of Devon and Cornwall. There is a good shrub at Kew in one of the bays formed by buttresses of the Temperate House. It is said to succeed in Kent.

Lagerstroemia indica (*Bot. Mag.* t. 405), China.—With light green leaves and flowers of lovely pink, this is one of the most beautiful of Chinese trees. I am not aware that it has been tried in Devon and Cornwall, but it deserves attention. It is said to grow with stems of considerable size in Washington, U.S.A. It has flowered on a wall at Ipswich, and succeeds in the shelter of a pine tree in Sir Edmund Loder's garden in Sussex.

Magnolia Delavayi (*Bot. Mag.* t. 8282), Yunnan.—In favoured parts of the country this should be a fine tree. It succeeds well against a wall both at Kew and at Coombe Wood. The leaves are large and persistent, the creamy-white flowers also large, and the tree is even a rival of the magnificent *M. grandiflora*.

Philadelphus mexicanus, Mexico.—A pretty shrub; in Cambridge safe only in the greenhouse, but hardy in the Isle of Wight.

Philesia buxifolia, Chile.—It is like a small shrubby *Lapageria*, and closely allied to it. Will succeed under the same conditions. The same may be said of the rare hybrid between them, *Philageria Veitchii*.

Rhododendron.—This magnificent genus cannot be overlooked. In south-west Cornwall the tenderer Himalayan species do well, and Mr. W. Watson, A.L.S., the Curator at Kew, in his excellent "Rhododendrons and Azaleas," in the "Present Day Gardening" series, gives the following list of those that may be seen there: *R. arboreum*, *R. Falconeri*, *R. barbatum*, *R. campanulatum*, *R. grande*, *R. Thompsoni*, *R. Griffithianum*, *R. Maddenii*, *M. campylocarpum*, *R. cinnabarinum*, *R. ciliatum*, *R. triflorum*, *R. niveum*. This is a valuable list for the use of the experimenter in other parts of the country. It must be remembered that soil without lime is essential.

Fig. 67.—Fremontia californica.

Fig. 68.—Thunbergia natalensis.

[To face p. 204.

Fig. 69.—Amaryllis Belladonna at Cambridge.

Fig. 70.—Hymenocallis Harrisiana.

Ferns.

It is possible to mention but few ferns. *Dicksonia antarctica* has already been referred to under fine-foliaged plants. New Zealand filmy ferns may always be tried under conditions that preserve the requisite moisture. *Nothochlaena Marantae*, native of Portugal, the Azores, Madeira, the Himalayas, &c., I have seen doing well under a bell-glass beneath the shelter of an apple tree near Worcester. *Lomaria procera* (*L. magellanica*) is sometimes very fine in western gardens. The New Zealand *Polypodium Billardieri* appears to be quite hardy, and the pretty *Pteris scaberula*, also native of New Zealand, I have known out of doors with little protection. The widely spread *P. longifolia* is not infrequently found growing as an escape on the outside of the wall of the house in which it has been cultivated.

The preceding notes are by no means exhaustive, but are long enough, no doubt, to answer their purpose. I would suggest that in the subject I have indicated a very interesting form of experimental gardening. "The best laid schemes o' mice an' men gang aft a-gley," but I am sure that anyone who takes it up would meet with a very satisfactory amount of success. I have referred for illustration chiefly to plants at Cambridge, but there are fine examples of this work at Kew. All around the outside of the Palm House, and all around the outside of the Temperate House interest will be found, and then, if I may refer to cold walls, in addition to warm corners, there are the fine old walls bounding and near the herbaceous ground, which for a long period have been a source of special interest. If one more remark can be permitted, it is that in the preceding notes I trust that suggestions will be found, not only by residents in parts of the country where warm corners must always be artificial, but also by residents in the south-west, in Ireland, Wales, favoured parts of Scotland, the Channel Islands, and the Isles of Wight and Man, parts of the coast where, from the present point of view, they exist almost if not quite ready to hand.

DROUGHT AND GARDENING.

By Prof. I. Bayley Balfour, M.A., F.R.S., V.M.H.

[Read May 14, 1912; Sir Daniel Morris, K.C.M.G., in the Chair.]

Being the Seventh "Masters Lecture."

When your Council did me the honour to give me the invitation to which I am responding I felt that I ought to endeavour, in anything I might say, to follow in the path of the name-father of these lectures by selecting a theme through which might be illustrated some bond between the practical operations of gardening and the scientific study of plant-life. Along this avenue of interpretation no one has advanced with more certain step than Dr. Masters. Wresting her secrets from Nature by his own studious research and grasping with critical acumen the points of investigation of others, he always held high the torch of Science and directed its illuminating rays to the elucidation of problems of horticulture. The *Gardeners' Chronicle*—which he raised to a position of unique prestige, now worthily maintained—bears on its pages the record of his earnest endeavour to interweave science and practice, and is our heritage of his effort to associate botany and horticulture in one advance for the benefit of each.

In the spirit of Dr. Masters' work I wish to speak to-day, and I have sought in the water-relations of plants for a subject upon which I might say something fitting on this commemorative occasion.

If the title which is attached to my lecture—"Drought and Gardening"—has suggested to any of my audience that the subject of which I am to speak has matured out of the exceptional meteorological conditions which were experienced in this island in the course of last year, let me at once undeceive them by saying that my theme is not immediately based upon the relations between drought and gardening as exemplified in the phenomena of recent experience. From all accounts such a relation might be summarized briefly in—enter drought, exit gardening. More definitely, perhaps, and as a striking head-line, the title might have run, "A Contribution to the Physiology of the Watering Can." How one wishes that a true physiology of that useful yet misused implement were possible! Yet I take it if mathematical precision were introducible in the matter of watering plants, or in the operations of gardening generally, much of the fascination of the garden would go.

You are all doubtless familiar with the paradox that to any one of us the danger in getting wet is the getting dry. As regards plant-life within the ken of the gardener one may invert the paradox and say that the danger in getting dry is the getting wet. The problem of the relationships of plants to their water-supply far outweighs all other problems that present themselves to the gardener. "Improper water-

ing is responsible for more failures than all other causes taken collectively" is a dictum I read in a recent gardening book. And we all agree.

The particular aspect of the water-relationships of plants to which I propose to devote the time at my disposal is that which in recent years has come to be known as physiological drought or dryness, a condition as influential upon life as the better-known one of physical drought or dryness. The phenomena in gardening, an explanation of which may be obtained by an appreciation of the meaning of this physiological drought, are familiar to all gardeners—but they are often cited as puzzles. Experience tells me that its point is often missed even by keen lovers of horticulture, and I take the opportunity of this occasion, therefore, to bring it before you. It is a subject that would have been after Dr. Masters' heart.

At the outset allow me to say that the starting-point of all discussions on the relationship of water to the life of flowering plants must be the bed-rock of gardening practice—that such plants obtain their essential domestic supply, if I may so call it, through their roots. I say this with deliberation.

The matter is one which scientific botany and horticulture cannot afford to ignore, because there has been of late flirtation with the old and often-expressed irresponsible suggestion that the water-supply of plants is derived by leaves from the atmosphere. A weekly periodical devoted some space to an exposition of the theory. Certainly the brilliant work which has been brought before this Society recently, showing the influence of "hormones" in promoting absorption by the leaves, opens a wide field for research, and tells us that we have yet much to learn of the relationships of the leaves to the atmospheric moisture. But at best the consequence of the influence described is only the operation of a regulator upon the plant-pump, without closure of the outflow. Turgescence is maintained, but the vascular system still works. Yet there are interesting cases showing more than this.

Thus: we had two pot-plants of *Euphorbia riparia* of about equal size, one of which, having a peculiar curvature near the apex of the stem, presented a construction conducing to the ready retention of water on its surface. The plants were placed side by side in a plant-house with an atmospheric moisture and temperature for "stove-plants." Neither plant was watered at the root, but a teaspoonful of water was placed two or three times a week on the cupped summit of the plant that showed the convenient receptacle. In course of some months a marked difference between the plants was apparent. The one which had not water placed on its stem gradually wilted and died. The other not only lived, but formed a vigorous continuation-shoot, and after two years, at the conclusion of the period of observation, had more than doubled in size. For its water-supply the plant was dependent upon water supplied to its stem.

This shows that in special circumstances—in a plant, that is to

say, attuned to drought under desert conditions with a competent water-storage system and sluggish vitality—aerial absorption by the shoot can do more than enable the plant to maintain life; but it does not bring us nearer the conception of the plant world taking its water from the air. The facts of gardening, of experiment, of plant-structure, emphatically deny the possibility.

What, now, is physiological drought as distinguished from physical drought?

By conditions of physical drought we understand those in which a plant finds the total amount of water in the soil on which it can draw is small. It is therefore exposed to the danger of being unable to get needed water, because there is none to get.

On the other hand, in conditions of physiological drought there is an abundance, or at least adequacy of amount, of water in the soil, but through one cause or another, temporary or permanent, the plant cannot take it in freely or even sufficiently to supply the calls of its organization. The plant finds itself in surroundings where there is "water, water everywhere, but scarce a drop to drink." The soil, though wet, is dry to the plant.

In using the expression "physiological drought," I wish to enter this caveat—it describes a state but does not designate a factor. The factors inducing the state are many, and because of this, exception has been taken to the use of the term as vague and unsatisfactory, as merely indicating the existence of some obstacle to the intake of water by the root. Admitted. But until further research has isolated and assigned to each factor involved in particular cases its relative influence upon root action, and thereby supplied analytical data for a more accurate terminology, the use of the term "physiological drought" in relation to gardening is legitimate and may be illuminating especially in bringing out the contrast with the condition of physical drought. Physical drought implies only a negative environmental state—physiological drought involves a positive relationship of the organism itself. The distinction appeals to one as valid. Yet we have to confess that observation in nature as well as experience in the garden appear to teach that the elasticity of constitution—if one may use a term taboo to many, but one designating a fact for which no better has been proposed—of certain individual plants enables them to deal almost as well with the one condition as the other. That is to say, to some plants, which are more or less attuned to a struggle in the matter of intake of water by the roots, the nature of the obstacle that has to be overcome seems to be of less than vital moment. A plant growing in conditions of physiological drought may live in certain other conditions more nearly akin to those of physical drought. I say more nearly akin, because in many conditions which we now regard as merely indicative of physical drought some physiological factor is probably operative.

Physiological drought may be temporary or permanent. The distinction is an important one for gardeners, because the causation is

not the same in the two cases, and whilst the former can be obviated, the latter faces us with a problem of organization of the plant.

As an illustration of the causation of temporary physiological drought, and of the phenomena exhibited by the plant in relation to it, I will take the influence of soil temperature. Lowered temperature—a cold soil—affects the living action of the protoplasm of the root, and water intake is reduced in consequence. As a cause the operation of cold is always temporary, though recurrent in nature.

The most familiar example of this effect upon plants in nature is that which we see in our climate in leaf-fall, which, to whatever degree it may be a fixed inherited character in many plants, is in origin a consequence of cold soil inducing physiological drought. To meet this the plant sheds the organs through which it may lose water, and thus arranges for the conservation of the supply it already has and of the limited supply it may yet obtain. Proof that leaf-fall is an outcome of drought is within the experience of every gardener who has transplanted a large holly or like evergreen. Well watered, as the transplant is sure to be, it throws off leaves. The process is hailed with satisfaction as a mark of vitality and indication of a successful move. True. But it is in fact a response to the condition of physiological drought brought about in this case by an obstacle artificially produced in the plant itself—namely, the diminution by cutting in the number of its roots. There are not enough of them to take in the abundant soil-water in amount sufficient for the organization of the head of foliage of the plant as it existed before transplanting, and the plant now conserves its water-supply by casting the avenues of outgo.

Temporary physiological drought is always threatening the gardener in his pot culture. Pot culture invites it. Everyone recognizes that there is a loss of water from the surface and sides of the ordinary garden earthenware pot as well as through the plant itself, and dryness requiring correction by addition of water is usually looked at in terms of these factors only as physical—an absence of water. But that is not always the whole story—nor do I imagine it gives us the true picture of the situation which so often has its outcome in what we call "over-watering." Take a case: a plant stands with its pot exposed to a cold draught or in cold still air and fully sun-exposed. Transpiration proceeds rapidly in the sun. The chilled roots do not absorb adequately. The plant flags—or, it may be, the time for watering comes round. Then we have the mis-use of the watering-can. More water is added to the cold soil already adequately moist, air is driven out, and the thirst trouble of the plant is increased by the further one of threatened suffocation—and this it is which kills.

Chilling of the root is harmful not directly through the destruction of roots by cold, but indirectly, and exactly in the degree in which it creates physiological drought and hinders thus the intake of water. Glazed pots—I presume introduced with a view to lessening the effect of evaporation from the pot—are yet susceptible to the effects of cold

air. The key to the advantage of plunging is to be found in its lessening the chances of physiological drought. Wooden pots are ideal.

In nature under our unstable climate we often see the same effect as that which I have just mentioned as attaching to pot culture. A day in early spring with a cold soil and a bright sun often ruins a gardener's prospects in respect of individual plants. The effect produced on them resembles much that of frosting, and is often so described; but the truth is that temporary physiological drought has operated—loss of water from the shoots exposed in the sun has not been compensated by an intake from the cold soil. An appreciation of this relationship suggests the necessary and usual prophylactics in mulching and shading.

Conditions of permanent physiological drought offer a more difficult problem to the gardener. Here he has to deal not merely with an environment, but with a plant attuned to it. And if the gardener modify the environment, the plant may not respond—cannot, indeed, beyond a certain limit, because its structural features have been impressed by an adaptation. He has therefore to thole the condition and make the best of it, and he can only do this if he understands the conditions and knows his plants.

In looking at this problem, two things have to be considered—

(1) The conditions bringing about permanent physiological drought.

(2) The attunement of the plants to it.

The causes of physiological drought are so many that I could easily spread myself over them in a longer discourse than time will allow of to-day, and I therefore select for the purpose of illustration that which appears to me to be the one which the gardener has most often to face. Acidity in the soil always means physiological drought. The form of it which most particularly falls within the domain of gardening is that which is impressed by humus in its extreme forms—peat.

A long history has yet to be written before grading of the acidities of humus and peat will be possible. Every gardener knows of the variation. Whatever be the result of ultimate analysis, this character may be taken as definitely established—peat soil is dry to plants. A plant growing in peat, however wet that be, is in a condition in which it finds difficulty in obtaining its water-supply—is in a state of physiological drought. In Nature the plant always shows that it is so circumstanced more or less. This is an expression of its attunement to the condition. It tells the gardener who has the seeing eye. For whilst many plants in nature have accommodated themselves to average conditions in the matter of water, and analysis has not sorted out up to the present time particular adaptations in them, all plants growing in conditions of a water-relationship outside the average—whether above or below—show in their bodies adaptations to this, and it is those below which we have to consider.

There are two directions in which Nature turns its efforts in the matter of modification of structure in relation to restricted water-

supply—that of conservation and that of obtention—and for the first of these it uses the shoot, for the second the root.

Reviewing the methods of attunement of the shoot, as we know them, adopted by Nature, she seems to say, "Drought is drought, however caused," and without criticism of obstacles. Water sufficiency is the main concern, and we find therefore shoot adaptations for conservation are much the same in all forms of drought, whether physical or physiological.

Take by way of illustration Nature's method of storing water. That means succulence of the stem or leaf portion of the shoot. You find it in Cacti and Aloë—plants of physical drought of deserts; likewise in plants like *Sedum villosum* and species of *Cakile*—plants of physiological drought in bogs and on sea-shore. Then the so-called "ericoid" habit, with its control of water content, gives us plants like so many Compositae—of physical drought on arid plains, and the whole heath family—of physiological drought in peat. Or, again, we have the control by woolly coverings of kinds in plants like species of *Marrubium* and *Lachnocapsa*—of physical drought in desert, or in species of *Saussurea*—of physiological drought on hill-tops, and so forth.

All these features—classed now in the terminology of botany as "xerophilous"—are no doubt known to you. It strikes one, however, as paradoxical when one first looks at the matter, that we should find the same growth-form in such diverse conditions of nature as are presented by a desert, a peat-bog, a hill-top, and the sea-shore. Without the clue of physiological drought and the knowledge that all these situations are dry to the plant, the presence in them of like growth-forms is a riddle.

If the attunement of the conservating shoot to conditions of physiological drought is of so general a character, attunement ought assuredly to be more definite in the obtaining root. In the root there is no mere garnering of stores and issuing of them under control for requirements of the household. The much more important task of capturing supplies of water and their intake falls to the share of the root, and for this a much more specialized mechanism should be required. It is there for our seeking. But it has not yet been well discovered. When it is the gardener will assuredly find guidance through it.

Where, as in the case of many orchids, the roots are aerial, and readily observable, our knowledge of the special adaptations they present is no less adequate than our knowledge of adaptations in the stem. But perhaps because of the fact that most roots are underground, their relationships to the soil have not been investigated yet to the extent they demand. The ordinary text-book description of soil roots gives only a generalized picture derived from comparatively few examples of accommodating plants, and does not at all apply, for example, to a whole series of plants of physiological drought which have no root-hairs and whose method of intake must be entirely different. Every gardener knows of the extraordinary specific variation

in root-form. The rapid progress in recent years of soil science gives hope that more research will be devoted to the acquisition of a knowledge of the special relationships of the root to the soil. I believe that it will ultimately be found that roots have a more specific relationship to their environment than that shown by the shoot, and the adaptations which will be discovered of the roots to soils of varying water content and of varying chemical constitution will be specifically defined.

To illustrate the special attunement that is observable in soil-roots in relation to physiological drought, I will continue my reference to features in plants growing in peat which, as I have said, is so typically a soil of physiological drought.

The first character deserving notice in the roots of peat plants is the existence of a fungus in association with the root to form mycorrhiza. Such an association is nowadays familiar to all horticulturists in connexion with the raising of orchids from seed. Like these young orchids, peat plants are attuned to the condition, and one must regard it as an important and fixed character in the organism. But remember, mycorrhiza is not specific. Any plant may form it, although certainly not the same fungus is engaged in every case. Most gardeners come in contact with this, although it may not be recognized by them. Thus, when plants are grown in tubs, and the surface of the tub in contact with the soil begins to rot, the roots of the plant will be found penetrating the wood and always having the character of mycorrhiza. No matter what be the plant grown the mycorrhiza develops in those conditions, and it is this character which calls for special care in the work of re-tubbing tub-grown plants when their roots have filled the tub. Rough removal of the wood of the old tub will take away also the mycorrhiza, and the plant will suffer from want of all that is involved in the presence of mycorrhiza. The disasters that so often follow separation of a plant from a tub in which it has long grown are explained by this.

We have in this a clue to some of the value of mycorrhiza to the peat plant. One may suppose that the initial invasion may have been guided by questions of nitrogen supply—the fungus taking from the soil organic nitrogen and passing it on to the host—yet it is impossible to separate the water problem from this, for the fungus aids in the intake of water from the retentive humus, and the development of the mycorrhiza is an adjuvant to water absorption and may be regarded as one of the adaptations to help in overcoming physiological drought at the point of intake of the supply. Nor is the function unusual. For in many plants of physical drought, where mycorrhiza is more developed than it is in peat plants, and forms a sheath to the root, it performs the whole work that is commonly done by the root-hairs.

But that is not the whole story of mycorrhiza and its value to the peat plant. Although discovered so long ago as the early years of last century, its significance is only now becoming recognized and

fully understood. It has been shown that the fungus of the mycorrhiza of some peat plants is a nitrogen-combiner and is able to tap the atmosphere as a source of nitrogen directly, and to bring the nitrogen into combination—a function only comparatively recently discovered as belonging to a few bacteria, and supposed to be a function of them alone. And therefore these peat plants, living in an environment whence nitrogen in the form of nitrate usually taken in by roots is not abundant, are able directly to obtain nitrogenous compounds manufactured by the fungus.

And here I may interpolate. The determination that this power belongs to higher fungi leads us to a much broader view of the rôle of fungi in Nature. Of their destructive power in living organisms, of their work in restoring to the service of life the nitrogen locked up and no longer of immediate purpose in the dead bodies of plants and animals, we have long known. But now the trend of evidence is towards the establishment of their position as circulators of nitrogen, not merely through decomposition, but also by bringing primarily from the store of the air fresh supplies for the service of living things. To the nitrogen of the air they would appear to stand in the relation which the green plant has to the carbon dioxide. A wonderful filling up this of the picture of the inter-dependence of living things.

Another feature in peat plants in their relation to physiological drought is most characteristic—that of the development of an acid mucilage. That the cell membrane of root-hairs may become mucilaginous, and thereby offer the plant means by which to cement its absorbing cells to the particles of soil from which they take in water, is a commonplace of botany, but the condition in the peat plants to which I refer appears more precisely determined. A distinctively marked mucilage-forming layer appears behind the root-tip, and through it the whole root becomes bathed in mucilage formed from it (see fig. 71), much in the same way as in the well-known cases of desert grasses and other plants, where the mucilage sheath becomes the cement of the sand tunic covering the roots. That this mucilage has something to do in connexion with water-intake is a natural conclusion, and it is noteworthy that it does not melt away readily in the water around it, but its exact relationship to water-intake and to the soil environment is not yet clear. Its early appearance and copiousness must preserve in the developing root an envelope holding moisture, which we may interpret as connected with the physiological drought. In many peat plants there would seem to be also some correlation between this and a late development of the water-carrying system within the root. The manner, too, in which the mucilage spreads out from the root over substances placed in contact tempts a suggestion of a still more important relationship on the part of the root. Certain is it that such roots laid on blocks of egg albumen groove them in much the same fashion as roots will impress their form on the surface of marble. In the Ericaceae the mucilage is present without any root-

hairs, but in the Melastomaceae the root-hairs develop and spread out through the mucilage.

These two features—the mycorrhizal fungus and the mucilage—in the roots of peat plants, whilst related, as I have suggested, to physiological drought, and to be interpreted partly in terms of it, have otherwise a significance in horticulture for a notice of which I wish to find a place here.

There is no cultural fact in gardening that obtains more recognition than this: lime in the soil is hurtful to Rhododendrons and other peat plants. You cannot grow Rhododendrons in a lime soil; if you wish to grow them in such conditions, you must dig out pockets for peat in which to plant. All of you have heard these statements, and will probably be inclined to agree with them. I have not yet

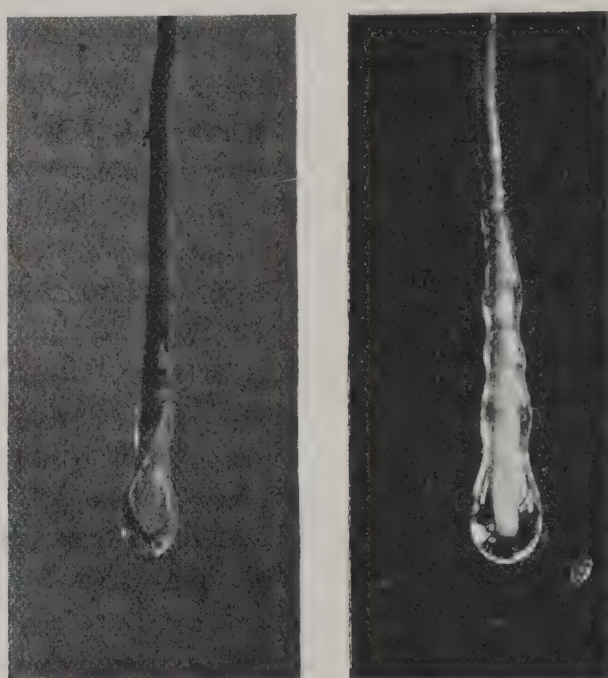


FIG. 71.—ROOT-TIPS SHOWING MUCILAGE SHEATH. IN THE FIGURE ON LEFT THE RED OXIDATION TIP SHOWS CLEARLY AS A DARK SPOT WITHIN THE MUCILAGE.

found, in cases where I have learned the Rhododendrons were growing in a lime soil, that they had not been planted otherwise than I have stated. Even watering with hard water has a harmful effect.

What is the cause of this? These plants are attuned to acid soil, and the suggestion is open that this acidity may be in some measure neutralized by the lime, and the amount so modified as to make the normal adaptation unworkable. Possibly, if the lime enter. But I do not think the cause rests in this single soil factor if it operate. There is evidence pointing to a direct influence on the plant itself through the two root features I have already referred to—the fungus of the mycorrhiza and the mucilage secretion—and these are, I suggest, by far the most important elements in the case, and on the following grounds:—

Although direct experiments are yet wanting, so far as I know,

relating to the cultivation of any special mycorrhizal fungus on lime substratum, we do know that certain soil fungi, which may therefore be mycorrhizal, will not grow upon lime soil.

Then, whatever be the function of the excessive acid mucilage, the neutralizing effect of the lime, if it reach the mucilage, should interfere with its action.

Further, seedling Rhododendrons watered with water rich in lime are deficient just in those features—mycorrhizal fungus and mucilage secretion.

Again, in the two European alpine forms of Rhododendron, which we may in general terms speak of as the peat form—*Rhododendron ferrugineum*—and the limestone form—*Rhododendron hirsutum*—the actual root structure differs significantly in the particular point of the mucilage-forming layer. The peat plant has a large one, the lime plant an indifferently small one.

All this evidence seems to be in the direction of showing that the cause of the refusal of Rhododendrons to grow in soil containing lime may be that lime prevents the proper development of mycorrhiza as well as the formation or action of the root mucilage, the two adaptations—particularly the latter—which the plant has apparently acquired in relation to conditions of water and nitrogen in peat.

I must take note here of this, however: modern discovery seems to suggest that all Rhododendrons are not attuned so specially as we have hitherto supposed the plants of the genus to be to peat and its drought. We know that *Rhododendron ferrugineum* of the Alps, whilst essentially a humus plant, is indifferent to this extent, that it grows upon limestone if there be a superlayer of humus, and in practice we know that *Rhododendron hirsutum*, though a lime plant, will grow in well-aerated peat. Mr. Forrest, who has done such magnificent exploration work in Yunnan, tells me that Rhododendrons grow luxuriantly on the limestone mountain ranges there—roots penetrating far into the crevices of the limestone rocks—very different this from our Himalayan forms. If these reputed limestone forms confirm the expectation which we may form, we ought to obtain from them valuable information bearing on the root-relationships of plants to soils, but beyond that the gain accruing to horticulture in a group of Rhododendrons, either true species or races raised by crossing, which would be not lime-haters, but actually lime-lovers, requires no emphasizing from me.

The recognition by the gardener of the indications in shoot and root given by plants attuned to such permanent physiological drought as are peat plants should be a help to him in solving his problem of correct watering. In essence, that is regulation in relation to the air-supply in the soil. How vital is this is shown by an interesting feature in the structure of the roots of many of these peat plants—namely, the presence of a bright red root-tip of variable size (see fig. 71). This tip—oxidation tip we may call it—is present in plants of so many families that it must have a general significance. It appears to be the

mark of the presence of an oxydase through which that essential excitant—oxygen—may be introduced to the root, and it is one which gardeners should notice. It indicates apparently a critical relation of the plant to oxygen in conditions of physiological drought, and suggests to the gardener, therefore, what is necessary for successful cultivation. Apart from the question of this character as a signal, we know by experiment that a main element in successful cultivation of peat plants attuned to physiological drought is aeration.

The generation of gardeners who remember the halcyon days when Cape heaths and Australian hard-wooded plants were dominant in horticulture is now almost gone from us. One has learned from them and read with envy of the wonderful specimen plants that were the glory of the horticulture of the epoch. Why has this class of plants dropped out of the domain of modern horticulture? No doubt many causes have operated, and it would be incorrect to specify any one as the chief one. But I do not suppose that I shall be wrong in saying that the supposed difficulty in their cultivation had a large share in the knocking-out process. Wherein lies the difficulty in cultivation of such peat plants in pots? Primarily physiological drought which compels most particular attention to watering. The plant has difficulty in taking in water—the soil is already compact, and each additional watering tends to make it more compact and drive out the air without materially benefiting the water-intake of the plant. In the absence of air the soil becomes more and more acid, and alike therefore in its water-content and in its air-content the condition of the soil becomes impossible to the plant. The gardener cannot here use lime for the neutralization of the acidity, and he must therefore encourage Nature's own process of combustion to prevent increase of acidity by providing facilities for the entrance of an ample supply of air.

The practical side of the problem was recognized long ago by that fine old gardener WILLIAM MCNAB, whose skill in heath-culture is a tradition in the gardening world. Keep the peat open by mixture of rubble—air and drainage are the secrets of this cultivation—that, in brief, was his teaching.

I have dealt with the special case of permanent physiological drought in peat plants because, as I have said, it is so familiar a phenomenon in gardening. Similar drought from other causes implies only other details.

The lesson I wish to impress by my theme is that the recognition of such a condition as physiological drought is of value to the gardener. Pointedly let me say, dryness at the roots is not always a matter of dearth of water in the soil surrounding them; and in correlation therewith the problem of watering must be studied in its influence upon oxygenation of the roots. That means life or death. To re-quote my authority, "Improper watering is responsible for more failures than all other causes taken collectively" in gardening. Why? It means suffocation.

Many years ago—but recently enough to be within the recollection

of many to-day—there was an interesting discussion in the pages of the *Gardeners' Chronicle* upon the subject, "How far does botanical knowledge aid the gardener?" The initial proposition was that a plant bears on its surface little that can inform the gardener as to the method of treatment he should adopt in its cultivation, and that botanical knowledge is therefore of little specific advantage to the gardener, who must depend upon his derived knowledge in cultivation and upon experiment for success. Dr. MASTERS, summing up the discussion with his characteristic calm outlook, pointed out that belittling of the value of botany to the gardener had its only basis in the confusion of the ideas implied in locality and in habitat—mere place of occurrence of a plant in nature is not of necessity an index of its life-relationships, habitat involves environment; and he insisted that the more the study of botany brings out an accurate knowledge of the exact relationship of plants to their environment, the more must its findings be to the benefit of horticulture.

Time has confirmed his foresight.

Looking, in the light of the botanical knowledge that has been acquired during the twenty odd years that have elapsed since that discussion, at the examples that were then cited as showing the small value of botanical knowledge to the gardener, it is interesting to find that a large number of them belong to the category of cases that are explicable by reference to physiological drought—a condition not then identified. Such puzzles of that time as the presence of the same species on the shore and on the hill-top, the cultivation of epiphytic orchids in a pot with crocks and peat, the growth of the same species in peat and in sand, and many others are now soluble by the application of the conception I have been endeavouring to place before you.

As it has been in the past so will it be in the future, and with increasingly favourable prospect.

Now, and for some time past, particular attention has been given by botanists to the study of the relationships of plants to their environment and to the effect of environment upon plants. Ecology, which is the name given to this study of conditions and relationships, is indeed the fashionable phase of botany at the moment, and its importance lies in the hope which it begets of the discovery and scientific definition of the causes which determine the vegetation of the world as we see it at the present day.

But the gardener is the greatest of all practical ecologists. He is always creating conditions, and his skill in understanding the requirements of his plants and in fashioning the environment to suit them is the measure of his success. If he constitute them aright the plant responds, otherwise there is disaster. The garden is the Experimental Laboratory of Botany.

If I say, as I do, that the science of Ecology would advance more rapidly were all its votaries practical gardeners, so also I will say

that horticulture as a science must gain if the practical gardener has knowledge of the scientific principles that underlie and may guide his practice. But in horticulture the event alone is apt to be the end, and the reasons for a specific practice and the causes which lead up to certain of its brilliant results do not always receive the attention that ought to be, and might be, given to them. What I mean is that empiricism leads to waste of energy through want of the application of scientific principles as an interpretation.

Granted—empiricism can advance horticulture, has advanced it, and will always advance it. The pity of it is its selfishness. In its glorified form it is the knack of the one, and with him it dies. Empiricism can never be systematic. Co-ordination is the first requirement of science.

Anyone who reads through the early volumes of the *Gardeners' Chronicle*—and there is no more fascinating reading to one who is interested in the ways of plants—cannot but be struck by the enormous amount of suggestive fact that is there recorded by practical gardeners which has failed to impress the progress of horticulture, has left botany untouched, and has been forgotten because of its isolation and want of correlation with some definite scientific principle.

The loss which botany as a science sustains through want of systematic method begotten of some scientific training in those who are in practical contact daily with the cultivation of plants is immense. If the loss to horticulture is not marked because not immediate, it is in the end no less great. It ought to be our aim to endeavour to lessen that loss if we cannot altogether prevent it.

The scientific education of the gardener is one avenue through which the object may be achieved, and regarding the necessity of advance along it, I do not suppose there will be any questioning.

But in these days of bountiful provision of grants to aid developments in rural economy an opportunity seems to be offered of securing means for directing empiricism in gardening, and it should not be neglected. I heard with pleasure recently the editor of the *Gardeners' Chronicle* give emphatic expression to the hope that in the assignation of the funds that have now become available for the promotion of investigation of practical problems bearing upon plant-life the claims of the competent practical gardener would not be overlooked. I desire to associate myself entirely with that, and I do so to-day with purpose. For the tendency in connexion with our modern stimulation to progressive achievement through endowment is far too much to work down from the theoretical. We want to work up from the practical. Induction is a more fertile mother than deduction.

I see that in the course of the important proceedings of next week (the Royal International Horticultural Exhibition) the question of the gardener's education is to be discussed. May I hope that the channel along which the discussion then flows will be not only the one now universally recognized leading towards the provision of schemes for

the scientific education of the young gardener, but that there will also be another traversed by a powerful current of opinion in the direction of measures for the utilization of the rich experience of the competent practical gardener.

With such an aspiration I may, I think, close fitly my tribute to-day to the memory of Dr. Masters.

THE REV. PROFESSOR J. S. HENSLOW AS ECOLOGIST.

By Rev. Professor G. HENSLOW, M.A., V.M.H., &c.

[Read June 18, 1912; Sir J. T. D. LLEWELYN, Bt., V.M.H., in the Chair.]

MY father was born in 1796, and died in 1861. As a boy he was encouraged to be interested in Nature by both his father and mother, who were fond of natural history; and especially by a Mr. SAMUEL, an assistant master in the school at Camberwell.

When an undergraduate at Cambridge he studied chemistry and mineralogy; and he was elected professor of the latter science in 1822. On the death of Professor MARTYN he was elected Professor of Botany in 1827.

After acquiring a familiarity with the British flora, he found he had no special taste for systematic botany. The study of plant-structure, solely for the sake of classification, did not appeal to him; but of geographical botany he was an ardent student. In a notebook in my possession he has epitomized a number of works by different writers, beginning with M. A. P. DE CANDOLLE's article on *Géographie Botanique*.* That botanist was the first truly scientific exponent of what is now called "Ecology"; for in that work he considers all the influences of the environment, or what Darwin called the "Direct action of the conditions of life." These are light, heat, moisture, soil, &c., which act upon plants. It is they which account for the distribution of plants. He describes the formations of "Stations," a word adopted from LINNAEUS. The study of these was "topography." We see an allusion to the struggle for existence, if not to "natural selection," in the sentence, "All plants of the same country hold civil war," and DE CANDOLLE describes a number of conditions which favour some species more than others; adding that with two species struggling together in different places, the results may be reversed. Thus "*Carex arenaria* in sand chokes those which in clay choke it." Such results should be described as the survival of the fittest *under the circumstances*.

In my father's notes on HUMBOLDT's *Tableaux de la Nature* and *Essai sur la Géographie*, he quotes that author's words:—"Botanists generally limit their researches to descriptive botany, but geographical botany is not less important." He observes himself:—"Botanists would rather receive one of our most common weeds from a newly-discovered or newly-explored country, than a new species of an already known genus. There are higher departments of botany than mere collectors of specimens are aware of. For, to ascertain the geographical distribution of a well-known species is a point of vastly superior interest to the mere acquisition of a rare specimen."

* *Dictionnaire des Sciences naturelles*, Tome xxviii. p. 359, 1820.

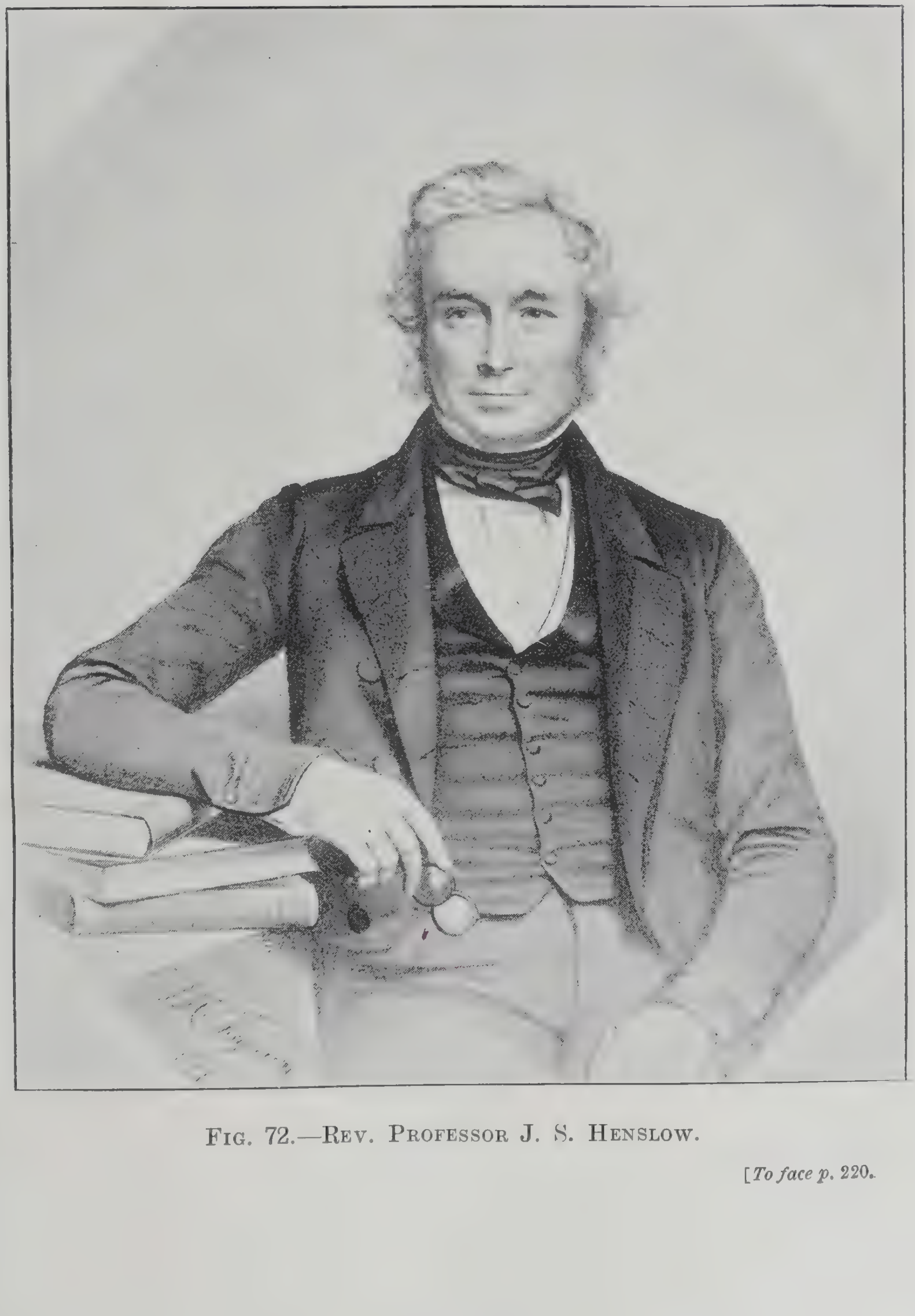


FIG. 72.—REV. PROFESSOR J. S. HENSLOW.

[*To face p.* 220.

He himself was most anxious to travel as a botanist; but the plans suggested for carrying out his wishes fell through.

As Professor of Botany his lectures were characterized by great lucidity and profusely illustrated by his own made diagrams * and plenty of flowers. He invariably made it an imperative rule to appeal to the eye as well as to the ear, and always insisted upon the examination of the flowers being practically done by the students themselves under his own eye during the lecture.

With regard to his own studies, he took up hybridization experiments, and worked out the anatomy of the hybrid foxglove *Digitalis purpurea × lutea*.†

Teratology, or the study of "monstrous" conditions of plants, also claimed his attention, *e.g.*, by his study of the malformed mignonette. He also paid much attention to the principles of phyllotaxis; and also to the variations in the leaves of *Paris quadrifolia* as well as the cotyledons of the sycamore; he was thus a pioneer in the modern study of "Biometry."

When he left Cambridge in 1839 for Hitcham Rectory, Suffolk, he still pursued various branches of botanical study, as well as experimental work; for instance, he tested the heredity of "weeping" in the ash, and found it only lasted for two or three years at most.

Parasitic fungi of wheat invited his attention, and he discovered that the black "mildew" proceeded from the same mycelium as the preceding red "rust," a fact not previously known. He did not, however, accept the statements of the farmers of Suffolk, that the "piperage" bush or Barberry was the cause of the rust; because the *Aecidium* on the leaves of that plant is totally different in form. Nevertheless we now know there was some truth in the farmers' belief!

As Ecology embraces the study of soils as affecting plants, he paid great attention to this matter, and induced the farmers to try experiments with ingredients recommended by LIEBIG. He also delivered series of lectures to the farmers on the best methods of improving their farms. These were subsequently published as "Letters to Farmers."

When at Felixstowe in the forties ‡ he discovered the now well-known "Coprolite" bed of phosphate nodules; and it was due to his bringing them to the notice of Sir, then Mr., J. B. LAWES, that they became a source of great commercial value to all owners of land containing the pebbles in Suffolk. He also made known the phosphatic nodules of the stratum called the "Greensand" by geologists, near Cambridge. This was a similar source of phosphate of lime for the cultivation of field crops.

It was my father who recommended DARWIN as naturalist for the *Beagle*. Although the dawn of evolution broke upon DARWIN'S mind

* I remember SEDGWICK in 1855 alluding to a somewhat crude geological diagram, saying that he much regretted he had not his friend HENSLOW'S skill as an artist.

† *Trans. Camb. Phil. Soc.*

‡ In those days (1843) Felixstowe, as now known, did not exist. There were only ten houses, mainly of wood, for summer visitors, and the Bath Hotel. The former were burnt down.

when studying the allied plants and animals of South America and of the Galapagos Islands, my father did not enter on any speculations as to the origin of species as being by "Descent with modification," except so far as his own experiments with primroses, &c., carried him. These might be called, in DE VRIES' term, "mutations" or sports, for he thought that the primrose, cowslip, and oxlip were different forms of the same species. He tacitly accepted HUMBOLDT'S and SEDGWICK'S view that fossils of different strata, seemingly very distinct, were separate creations and not variations by descent. Of course, it is the innumerable intermediate forms between fossil species, and amongst living creatures, now known, which render the conception of separate creations inconceivable; to say nothing of the many cultivated forms of plants and domestic animals, illustrating modifications by descent.

The idea of plants changing their structure and form, thereby giving rise to new species, was by no means new, as the following short extracts show; but when the mind has been long led to believe in one special view, which is taken for granted as true, any other does not recommend itself all at once. Hence neither HUMBOLDT nor GRIESBACH saw that the natural inference from their observations led directly to the idea of evolution.

Even in the sixteenth century BACON recommended experiments to test the "transmutation of species": "We shall do well to take marsh-herbs and plant them upon the tops of hills, and such plants as require moisture upon sandy and very dry ground—as, for example, marsh-mallows and sedge upon hills; so, contrariwise, plant bushes, heath, ling, brakes upon a wet and marshy ground." *

We read in HUMBOLDT'S *Cosmos* † "The physical description of the globe teaches us that vegetation everywhere presents numerically constant relations in the development of its forms and types; that in the same climates, the species which are wanting in one country are replaced in a neighbouring one by other species of the same family; and this *law of substitution seems to depend upon some inherent mysteries of the organism considered with reference to its origin*. . . . It might be said, in accordance with a beautiful expression of LAVOISIER, that the ancient marvel of the myth of Prometheus was incessantly renewed before our eyes." Prometheus formed men of clay and animated them by means of fire brought down from heaven.

GRIESBACH, in his *Végétation de Globe* (1877),‡ observes: "The repetition of analogous forms produced independently of the geographical position would accord with the idea that the constitution of a plant is only the result of the physical conditions which have presided at its birth." Again, he says: "The centres of vegetation depend upon their geographical position, and the organizing forces possess the faculty of always adapting the results to the physical conditions of life—without, however, our knowing the processes by which this force works, because

* *Century*, vi. † 1844, Bohn's ed. p. 43. ‡ I. pp. 9, 10.

our observations can only perceive the results, but not the line of development which has produced them."

Though the word "Ecology" was not invented in the first half of the nineteenth century, the spirit of it, or the "study of plants at home" we thus see, was there, and underlay my father's view of the true method of learning, as well as teaching the science. In the introduction to his *Practical Lessons on Botany* (1858) he wrote: "In order to employ botany as a strictly *educational* weapon we must *not* confine ourselves to *telling* children the names of plants, how they may be grouped, what properties they possess, &c. We must *exact* the requisite *attention* to the *structure* of plants. This demands a *personal observation of facts.* A decided *mental effort* is required to derive just *inferences* from them in regard to their relationships. Experience has satisfied me that Structural Botany, or Morphology, may be more conveniently and extensively employed than any other branch of natural science for strengthening the observant faculties and expanding the reasoning powers of children in *all* classes of society."

Darwin's ecological works on the fertilization of orchids, climbing plants, insectivorous plants, &c., had not been written, so the stimulus of these invaluable books was wanting; but my father never missed an opportunity of illustrating his teaching with the connexions between plants and their surroundings, whenever available, such as the injurious effects of the yellow-rattle parasitic upon grass and of fungi attacking wheat, &c.

In 1848 the Ipswich Museum was opened, the Rev. W. Kirby being President, when my father was asked to give the inaugural address. His lecture is full of practical advice to all who really wish to know something of science, to abolish superstitions and a priori assumptions, &c. The importance of science was driven home by applications of its practical uses. He pointed out the profound ignorance that prevailed at that time not only among the illiterate but others. Thus on the first occasion of the meeting of the British Association being held at Oxford in 1844, the following was published in a review by a chemical professor: "Few will forget who were present at the first exhibition of one of the most wonderful discoveries of the age (namely, the extracting of electric fire from cold iron by the distant influence of the loadstone) the effect which was produced by the reply of one of the heads of houses, now no more, to the eminent philosopher who was specially communicating it to him. 'I am sorry for it, sir; we have had enough of late of incendiary doings.'"

Besides botany my father studied the habits of insects, as wasps and hornets. He made two large collections, one being now in the museum of the Philosophical Society of Cambridge, the other he gave to Sir J. D. Hooker. He kept in cages a number of harvest mice and two huge toads. It was my delight as a boy to feed these with captures in a butterfly net from the lawn, sweeping it over the unmown grass.

The above will perhaps be enough to give a rough sketch of the scientific habits of my father.*

I cannot do better than conclude with my uncle's words at the end of his memoir: "When a good man dies the world does not cease to benefit from those labours of love which he undertook for his fellow-men. Though personally removed from them his example remains; his voice, too, is still heard in the lessons left to be handed down to those who come after him. The influences of Professor HENSLOW'S teaching have been felt in other places than those in which he himself taught; they have borne fruit far beyond the obscure neighbourhood in which he first sowed the good seed; and who shall say to what further results they may not grow in years to come, bringing honour to his memory, and what is far more, glory to God? 'A word spoken in due season how good is it!'"

* A full account of his life will be found in the *Memoir of the Rev. John Stevens Henslow, M.A., &c.,* by Rev. Leonard Jenyns (1862).

FIG. 73.—WISLEY ROCK GARDEN—THE MOVING OF THE STONE.

FIG. 74.—THE TOP WATERFALL.

[*To face p.* 224.

Fig. 75.—Lower Down the Stream.

Fig. 76.—Still Lower, Nine Months Later.

THE WISLEY ROCK AND WATER GARDEN.

By J. R. Pulham, F.R.H.S.

[Read August 13, 1912; Mr. J. Hudson, V.M.H., in the Chair.]

Bold indeed would he be who attempted, at the present time to add to the volume of information, correct and otherwise, which exists upon the subject of rock and water gardening, and I certainly should have felt considerable diffidence in approaching my task to-day, but for the fact that I am dealing—in I fear, a somewhat imperfect manner—with a specific example, and one coming under my own observation.

One is inclined to marvel at the tremendous growth that has taken place in the love of rock and water gardening in this country during recent years, and not only in this country but abroad, for it is a cult which has "caught on" in America and on the Continent.

One looks back to the time, not very long since, when rock gardens were to be found only in the more important gardens, and even they were not, perhaps, such as we see to-day. The reasons for this are not far to seek; the chief one being the inevitable reaction from the severe formalism, which was carried to such excess during the eighteenth century and later. In this connexion, yeoman service has been done by Mr. William Robinson, and while there may be many who do not quite agree with all his trenchant criticisms upon the old style, which, after all, had much to recommend it when *not* carried to excess, they yet feel that in the main he was right; for not only did he criticize the old but pointed the way to a better and saner one.

In his early time there were few who had not heard of the beauty and vividness of colour of alpine flowers, but such knowledge was usually accompanied by the notion that they could be met with only upon the higher ranges of the Alps, and that it was impossible to cultivate them at lower elevations. This idea had been promulgated, more or less, by some of the most famous botanists and horticulturists of the period. Once it began, however, to be instilled into the minds of the garden-loving public that it was possible to have alpines growing literally at their own front door, it became apparent that rock-gardening was a branch of horticulture which had come to stay, for everyone with any garden at all desired to introduce alpine plants, until none is now considered complete without a portion being devoted to them.

This tendency having asserted itself to such a great extent, it was small wonder that the Royal Horticultural Society should, when obtaining possession of the gardens at Wisley, take into consideration, amongst many other improvements, the construction of a rock garden on a more or less extensive scale. This project was assisted by the fact that they possessed a site on a hillside in many ways well

adapted for the purpose, especially so as it was out of sight of all formal and artificial surroundings, and consequently free from all elements of incongruity.

I think I am not giving away any secrets when I say that suggestions for a rock garden were considered by the Council during their earlier occupation of Wisley, but nothing definite was undertaken until the summer of 1910, when it was resolved to invite a few firms to submit plans and schemes for their consideration. Certain necessary conditions were specified, within the limits of which a wide discretion was allowed to the competitors, who were given a fixed sum to work upon. The schemes were to be delivered to the Society by December 1, 1910. One of the conditions laid down required competitors to submit samples of the stone they proposed to use in construction to enable the Council to judge of its suitability.

After mature consideration, the scheme of Messrs. PULHAM was selected. The designer of a rock garden should be, on his own lines, as much an architect as he who designs houses, as Mr. FARRAR very ably expresses it in his admirable book. Messrs. PULHAM kept before them one leading idea—viz., that every rock garden must have, above all things, a definiteness of plan and an aim to reproduce with fidelity some particular feature of Nature. Then, and then only, can success be obtained.

In preparing their scheme, they fortunately succeeded in obtaining the professional advice and assistance of Mr. EDWARD WHITE, under whom they have constructed many rock and water gardens in the past. Mr. WHITE collaborated with them throughout, and advised as to the landscape portion of the scheme, for it was realized that this important work, being for the premier horticultural society, should be not only an example of what a rock garden ought to be, from both educational and picturesque points of view, but one that might rank among the finest in the kingdom. It was therefore desirable to confer with a landscape-gardener of wide experience, so that no detail, whether from a landscape or rock building point of view, should be overlooked.

Perhaps at this point I ought to make a slight digression. Many Fellows of the Society have probably seen the rock garden itself, either in its completed state, or during construction, or at any rate remember the site. I am bound, however, to describe it more or less in detail, for the benefit of those who have not seen it.

The site selected was a fairly wild spot, about an acre and a half in extent, covered at the top, or south-east part, with rough turf, containing bulbs and a few deciduous shrubs, and a number of apple trees, while along the bottom ran some ponds, picturesquely flanked on one side with Gunneras, Osmundas, Bamboos, and similar subjects, while on a portion of the bank rising from the water was a fine group of conifers containing, among others, *Retinospora obtusa compacta*, *Juniperus canadensis aurea*, *Picea pungens glauca*, and a large *Cupressus Lawsoniana*. These, it is hardly necessary to say, it was proposed to

retain and preserve as a feature, a few naturalistic outcrops of rock being suggested in the banks and surroundings, to bring this portion of the ground more into harmony with the rocks above, without altering the general appearance and contour, which were already quite happy.

Crossing the larger pond was a rustic Silver Birch bridge, which remains, and from this it was proposed that vistas should be obtained looking upwards through a valley formed by manipulating the intervening ground between this bridge and the principal scenic feature in the rock garden, a waterfall in the highest part of the ground. The water from this fall flows down the hillside in a series of pools and small falls, to the ponds below.

The introduction of this waterfall and stream was, perhaps, a somewhat bold stroke, considering that the site appeared to be devoid of water with the exception of the lily pools already referred to. The designers of the scheme felt strongly, however, that it was very desirable, for many reasons, to introduce water, the chief one being that, in their estimation, a rock garden without the damp and sedgy places which are necessary for the well-being of the many moisture-loving plants might well be likened to "Hamlet" without the ghost. A short extract from the accepted specification and report, dealing with this part of the scheme may help us to follow it a little more closely:—

"The question of water needs careful consideration, for we anticipate that none will be met with in excavating the bank. For the purpose, however, of giving character to the rock garden, we have indicated a streamlet trickling through the site from the top corner, which, winding about with its series of waterfalls, finds its way to the sedgy pools below. Any land drains that may be found will be utilized as far as possible. If it be desired at any time to have a continuous supply of water, it could be secured by means of an oil or petrol engine, connected with a centrifugal pump, to draw the water from the lower pools and force it up into a small reservoir at the top, in order that when running water was required the engine could be put in motion. There would be practically no waste of water, the same being used and re-used."

Amongst other proposals comprised in the scheme were a bog garden, and an entirely new path leading into the site, the latter entering at the top corner and traversing the higher part of the ground. Hitherto—no doubt on account of the site being so little frequented—the only existing path conducted visitors direct to the bottom along by the ponds. Had this been retained as the only path it would have involved climbing up to the higher parts of the rock garden, a height of about fifty feet, to the top, and back. This the new path obviates.

Having accepted the general scheme, the Council, being desirous of making some slight alterations, invited Mr. WHITE and Messrs. PULHAM to meet a small sub-committee to consider these points. A meeting at Wisley was therefore decided upon, preparatory to which some trial holes were sunk for inspection, to ascertain the exact nature

of the soil. The whole site was staked out ready for this meeting, in order to show the stream, paths, and tracks.

On sinking the trial holes, it was found there was about two feet of good soil on top, with a stiff, yellowish sand beneath, to a considerable depth. The water-supply was fully discussed at this meeting, and Messrs. PULHAM were asked to prepare the scheme they proposed for this more in detail. With the sub-committee's concurrence, however, they modified their first suggestion in some of its details; for instance, instead of pumping the water from the lower ponds, and allowing it to fall back there, it was decided that, in view of the watering that would have to be done in connexion with the rock garden, an independent supply was necessary. This was found in a well in the lowest part of the grounds, which had once been used to supply the gardens with water, and, although it had been discarded for some years, it was scarcely likely to fail, as the water stands level with the river running near. Perhaps, as the proposal was carried out, it will be best for me to finish this part of the subject by describing, briefly, the modus operandi.

A small, picturesque, heather-thatched building was erected over the well, and in it was laid down a petrol engine attached to a pump connected with the water, to lift and force it through a pipe up to the highest part of the rock garden, where a brick and concrete circular reservoir of several thousand gallons' capacity was constructed, below the ground level, to be concealed later by a belt of shrubs. From this reservoir the water flows over the principal waterfall, and so down the stream into the pools below. It is proposed to keep it fully charged during the season, so that during the hours Fellows usually visit the gardens the engine can be working and water may be running over the falls. Provision has also been made for the tank to empty itself about half-way down in case it may sometimes be necessary to run water over the falls at a time when, for any reason the engine is not working. In such a contingency, the top portion of the principal fall is silent, otherwise the effect is the same. Along the line of the supply pipe junctions are fixed, with stand pipes for hose attachments, which will be used for watering purposes, a very desirable acquisition, particularly in dry weather.

Having, I hope, fully explained this part of the work, I will now revert to the general scheme. As there was necessarily a considerable amount of ground-work to be carried out, and soil to be moved, a tram-way was laid on the site, the ground cleared, and the rough turf taken off and laid aside to rot. All suitable soil was stored near by ready to place the rocks in, and for reinstatement as top soil after. The whole site was then roughly shaped, the paths and stream excavated, and the undulations formed in the rough.

In making the excavations, some land drains were found, which were all conducted into the stream at the nearest point.

As may be judged, the ground-work occupied some considerable time, during which a supply of rock stone was being imported and

stored as near as practicable. In order to bring this and other material to the spot, another light railway was laid across the fruit garden above the site, leading from the nearest road, a distance of some four hundred yards.

The stone adopted was a Sussex sandstone, selected on account of its good bold shapes and sizes, and for its pleasing colour, which harmonizes well with the soil, so that the rock appears to have been discovered and partially exposed in places. The stone was taken to the various parts of the garden by means of the tramway and other suitable appliances and placed in position. Fig. 73 shows some of the heavier stone being moved, and gives a good idea of the steep nature of the bank in places. Each and every stone was laid on its proper bed—*i.e.*, practically in the same position as quarried, thus adhering as nearly as possible to the natural formation. In shaping the ground care was taken to obtain as many south aspects as possible, necessitating very careful manipulation, owing to the fact that the bank faces north-west. This was done in order that adequate provision might be made for accommodating plants thriving in different aspect, for the chief aim or purpose of a rock and alpine garden must be the growth and well-being of the plants, the actual display of the rocks being, of course, of secondary importance. There is no valid reason, however, why the formation of the rock itself should be a bad second; quite the reverse, for the ideal rock garden is that in which the stone is placed in a bank or cliff with due regard to Nature.

There are many who seem to be obsessed with the idea that all element of design can be a minus quantity in the rock garden, that any disorderly heap of stones suffices: hence we see, even in some of our foremost gardens, stones dropped apparently anyhow, in a chaotic manner, as though shot from a cart, and plants thrust among them. Sometimes square bits of granite kerb, broken gas-retort, and even clinkers, are pressed into the service. How can any rock garden look or be natural when made in this haphazard fashion? The perpetrators of these outrages apparently forget that the rules of the rock garden are the rules of Nature herself. "Oh!" but I hear some apologist say, "the plants will soon grow up and hide all that." A poor excuse, indeed! Why should all the rock be hidden? You must have some of it visible to harmonize with the beautiful colours of the plants with which it is clad. And what a poor apology for the rock builder to have to make, that the formation of the rock is so bad that it must all be covered up as quickly as possible, lest the susceptibilities of the critical be shocked.

It was felt that the construction of the rockwork at Wisley, of all places, should be such that every subject should not only look, but be, perfectly at home, and, as nearly as such could be obtained, in its natural haunt. Thus, each stone individually was carefully bedded in soil, at depths to suit the varying requirements of the alpines and shrubs, with a suitable dip and root connexion towards the mother earth, interstices being left between each and every stone for the purpose.

The first portion to be built was the main, or top waterfall. I may say that I had hoped the planting generally would have been more forward ere this, as, even now, the rocks are very bare. There is a fine lot of *Sempervivum* in the crevice between two stones here (fig. 74), which stones, by the way, have been so placed as to appear to have slipped from the mother rock, and form what is known as a geological "fault." In a bed of soil here is *Primula deflexa*, very much at home, the bank behind being damp and fairly shady. *Primula frondosa* (Hort.) also grows well in a similar position; this was only planted early in the spring, and flowered well a few weeks later.

The bank adjacent to the waterfall was steep, consequently the rocks had to be constructed to obtain a cliff or wall-like effect. At the foot of this cliff it was more or less damp, so opportunity has been taken to introduce various Primulas, including *Primula japonica*, *P. rosea*, *P. denticulata*, and *Haberlea rhodopensis*. Fig. 75 shows a distant view of this fall, the cliff referred to, and one or two nearer falls, while fig. 76 is a view taken from a little lower down, nine months later, where the cliff shows plainly. The distant effect of this portion should be particularly bold and telling later on when the rocks are furnished, and the massive cliff is surmounted by Rhododendrons, with a background of Pines, whose dark colour throws into relief the brighter foliage and the grey of the rocks in the foreground.

Other portions were, of course, also being constructed (figs. 77 and 78) at this time. These two figures are interesting from the fact that they show the actual formation of the rock. They also give a very good idea of the slope of the ground.

The stream was followed down from the top, and is concreted so as to appear quite natural from end to end. Every section, or length between each fall, is provided with a proper valve, in order that it can be emptied separately and cleaned out, whenever occasion may arise.

Did someone start at the mention of the word "concrete" just now? I am well aware that there is a more or less acute difference of opinion on this subject, many advocating puddle in preference to concrete, because, in their opinion, the latter looks hard, and the edges have a way of intruding themselves, making the stream or pool look artificial—a most undesirable result. But to those who hold this view, I may say that, for efficiency, there is no comparison between the two, and, if concreting is properly undertaken by those experienced in its uses and abuses, it is infinitely more effective, and better in every way, especially for cleaning-out purposes, as small streams soon get filled with leaves, weeds, and rubbish, particularly in the autumn, and it is difficult to clean them out, when puddled, without the risk of damaging the bottom or sides and losing the water. It is also urged by the advocates of puddle that a pond or stream holds water better if so treated, for does not concrete crack and cause leakage? I must admit that such is occasionally the case, but it is generally only from a lack of knowledge of the best materials and the way to use them, which knowledge only years of careful study and constant experience can

FIG. 77.—WISLEY ROCK GARDEN IN COURSE OF CONSTRUCTION.

FIG. 78.—WISLEY ROCK GARDEN IN COURSE OF CONSTRUCTION.

[To face p. 230.

Fig. 79.—The Lowest Fall, 1911.

Fig. 80.—The Lowest Fall, 1912.

bestow. This constitutes all the difference between success and failure.

But to return to Wisley. There are no concrete edges visible here; in fact, it is difficult to discern that the stream is concreted at all. In various places the edge has been kept low, so that the water can find its way over when the stream is full, forming boggy beds at the sides for the benefit of the moisture-loving plants which thrive so well in such situations. In the total length there are twelve small waterfalls, care being taken that no two should be alike in form or appearance. In constructing these falls, a certain amount of special cement, of the same colour and texture as the stone, was used; for stone, if piled up, however carefully, would not withstand the weight of water, and in consequence would soon be washed away. This cement is brought right up to the edge where the water comes over, and, by a special process, is joined to each stone forming the fall, thus conducting the water over properly, it finding no other way out behind or beneath, a not infrequent occurrence with falls improperly constructed. By this means none of the water is wasted, and a maximum and picturesque display is obtained over each fall. The lowest fall (fig. 79) empties into the ponds between a *Gunnera* and a group of Osmundas forming quite a natural feature. Fig. 79 is from a photograph taken during the construction of the work, and fig. 80—from the same positions—quite recently, showing more planting about it.

As far as it was possible, consistent with stability, the rocks around this part were placed in the bank without disturbing the growth more than was absolutely necessary, and, as a matter of fact, very few plants or shrubs were removed or interfered with around or near these ponds.

In excavating the ground, it was discovered in one or two places that the bank was constantly damp. Advantage was taken of this to make special provision for Ramondias (fig. 81) and other moisture-loving alpines. I succeeded in obtaining a photograph of two of these last October, and, though they were only planted during the previous summer, they appear to be quite at home. Here are *Ramondia pyrenaica* and *R. Nathalie;* at the side is *Shortia galacifolia*, while near by is a fine specimen of the silver variegated Chinese Juniper. Close by too are Edelweiss, and *Saxifraga longifolia*, Queen of Saxifrages, planted on its side to prevent water settling in the crown. *Erinus alpinus albus* is in a crevice between two overhanging rocks, where it seems to have taken a good hold. In a season or two these should produce very effective corners.

In the carrying out of the work, a cavern for filmy ferns was introduced. It was not shown on the plan, or included in the original scheme, but was suggested by a member of the Council during a visit to the site after the work was commenced. It was a meeting of the Garden Committee, and the member in question, observing one or two land drains that had been recently unearthed, suggested that they might be utilized in this manner. These pipes apparently conducted the water from a spring higher up the bank, as during two dry seasons

they had not failed. They were relaid, to bring the water to the highest part of the cave, so that there is a constant drip and plash of water, keeping the whole place moist. *Todea superba* and *Asplenium fontanum* are thriving in the cave. There is a pool over the whole of the bottom, which also runs out in front at the same level. To the left, is a group of *Spiraea Filipendula plena*, and on the right, *Rodgersia podophylla.* Access to the cave is by means of rough stepping-stones, and on top of it *Juniperus Hudsoni* is planted. The overflow from the pool runs into the bog garden (fig. 82) just below. Owing to the steep nature of the bank, and this being the only available site for a bog garden, it had to be formed in three different levels. The ground was carefully dealt with and puddled, and stepping-stones placed about it to give easy access for the inspection of the various plants at close quarters. This, in fact, applies to the whole of the rock garden, one point being constantly before the designers—*i.e.*, that visitors should be able to inspect almost every object in the garden closely, without the necessity of stepping on and perhaps injuring some plants in the attempt to obtain a better view of others. There is an alternative supply of water for the bog garden, which can be turned on in case of need.

The rock garden would not have been considered complete without a moraine. It is difficult in this country to obtain the conditions which obtain in the homes of the alpine flora, yet, with care and knowledge, these conditions may at least be approximated. It is only recently that any serious attempts have been made in this country to form moraines, though I understand Mr. FARRAR made one in his rock garden some few years since; but they have not often been tried. Yet some very charming alpines are found in the moraines in many mountain gorges, and there is no reason why, given the necessary conditions, even if the hand of man has something to do with the preparation of their home, we should not induce many of them to thrive here.

At Wisley it was desirable to introduce a moraine. A certain amount of moisture underneath, so arranged that it can be regulated and the " soil " kept constantly and uniformly damp, without being too boggy, but always well drained, is one of the chief characteristics of a moraine. At Wisley the beds are puddled, so that ample control over the moisture is assured. Stones are placed to form divisions in the beds, and give the necessary levels, an arrangement being made by which each bed can be relieved of superfluous moisture. Over the water-tight bottom is a six-inch layer of coarse stone, and above this a lead pipe is laid to supply each bed, every pipe having a separate tap connected with the main water-supply, so that any or all of the beds can be moistened from underneath, as required. These pipes are perforated at intervals, along the under side, to insure an even distribution of water when the tap is turned on. After the pipes had been properly tested the beds were filled and fine stone chippings laid over

Fig. 81.—A Site for Ramondias.

Fig. 82.—The Bog Garden.

[*To face p.* 232.

Fig. 83.—A Path in the Rock Garden.

Fig. 84.—The Rock Garden Steps.

Fig. 85.—A Planted Part of Rock Garden.

the top to a depth of a few inches. Needless to say the mechanical contrivances connected with this are well hidden.

Last autumn *Edraianthus serpyllifolius major*, *E. Pumilio*, and *Androsace carnea* were in the moraine, while a month ago *Campanula cenisia*, *C. excisa*, and *C. pulloides* were in bloom there. That rare and difficult alpine, *Eritrichium nanum*, was also tucked in between two stones laid at a sharp angle, and was receiving moraine treatment.

All the principal paths (fig. 83) were taken out to a depth of about six inches, with a trench about six inches deeper along the middle of each. In this trench a land drain is laid and filled in round with rubble, so that ample drainage is assured. These drains discharge either into the cave, the bog garden, or the ponds below. The surface of the whole of the paths within the confines of the rock garden is paved with rough, irregular, stone slabs, provision being made for Sedums, Sempervivums, and other small plants to grow in the interstices.

Owing to the steep nature of the bank, many rough steps were put in (fig. 84) to enable visitors to get about with greater ease, and in the open joints of these steps many Sedums, Saxifrages, and other suitable plants have already been planted with happy effect. On the side of the path a colony of *Gentiana acaulis* has been planted in good firm soil.

The rock garden was finished by the end of August last year, and in the early part of that year the Council appointed a gardener specially experienced in rock and alpine plants to plant and keep it in order. On commencing his duties, he started with such plants as could be obtained from other parts of the gardens and some presented by the Fellows. I might perhaps emphasize the fact that the Council will gratefully accept plants suitable for planting here. The top portion of the rock garden is perhaps the most completely furnished of any, but some bold planting should be undertaken, as soon as possible, chiefly with effective flowering and evergreen shrubs. No doubt the Council will see their way clear to pushing on with this most important work during the coming season. Figure 85 shows a portion which is more thickly covered than much of the other part. Here is a carpet of *Trifolium repens atropurpureum*; on the edge of the stream is *Myosotis Welwitchii*; above that is *Gypsophila prostrata rosea*, while further along the path is a good example of *Sedum stoloniferum*. Amongst some other noticeable objects in various parts of the garden I may mention *Juniperus littoralis*, *Primula megaseaefolia*, *Androsace lanuginosa*, *Gentiana verna*, and *G. cruciata*.

THE FLOWERS OF APPLES AS AN AID IN IDENTIFYING VARIETIES.

By Edward A. Bunyard, F.R.H.S.

[Read June 16, 1912; Mr. J. Hudson, V.M.H., in the Chair.]

A casual inspection of a number of different varieties of apples in flower reveals many differences even to the unpractised eye, and a closer inspection shows that the flower presents many characters which may be of great aid in determining, in difficult cases, the correct nomenclature of the variety.

It may be asked "Why is this minute detail required; cannot we rely upon the fruit alone for purposes of identification?" There are cases, however, where it is extremely difficult to separate two similar varieties, and others occur in which, though fruits are practically identical, two varieties may present certain well-marked differences which are valuable from the cultural point of view. As an example of this we may cite the case of the existence of two forms of the apple 'Borovitsky' ('Duchess of Oldenburgh') which are practically alike in fruit and leaf characters, but whilst one form thrives only in the southern parts of Russia, the other will grow in much more northern latitudes. Any small detail therefore of the flower in which they differ would enable the distinction to be made without an actual experiment. Furthermore, the importance of full and accurate descriptions cannot be overrated. Quite apart from the interest of deciding cases of doubtful nomenclature, a very considerable practical issue is often involved. Pomology is largely a matter of tradition, knowledge being handed on from one generation to the next, and whilst this actual practical knowledge is of the first importance, and without it the merely book-learned would fail dismally, the converse also holds some truth. The traditional pomologist cannot afford to dispense with records. As an instance of this danger we may mention the curious error in regard to the apple 'Mère de Ménage.' This apple was introduced into England in the early part of last century and bears no resemblance whatever to the true 'Mère de Ménage' of the Continent, from whence it was imported. An error in orthography probably started the mistake, which has persisted in this country for nearly a hundred years. The apple is probably a sort much grown in Flanders formerly as 'Mère des Pommes,' and the similarity of names doubtless caused the confusion. Unfortunately, though a coloured plate of the 'Mère des Pommes' exists as well as a description, the latter is not detailed enough to decide the point with absolute certainty.

This case establishes the point which we are trying to make—namely, that a reliance on tradition without records is a dangerous practice, and, further, that records should be ample and systematic.

The botanist will not undertake the naming of specimens from one part of a plant alone as a general rule, and the pomologist, whose material is often fully as difficult, should for the purposes of accuracy be able to refer to the most fully detailed records. That all advance in science is due to greater accuracy is a truism, and pomological science is no exception to this rule.

The special points considered in this paper are:—

Flowering season.
Size and shape of flowers.
Colour of flowers.
Sepals.
Styles and stamens, comparative lengths.
Styles, various forms.

In regard to these characters as a whole we may say that they are less subject to variation than any characters of the fruit, leaf, or wood. Conditions of cultivation have much less effect upon the flower than upon other parts of the tree, and in all cases the observations have been made over a series of three years, and the facts do not therefore relate to one season only, but have been twice confirmed.

The writer does not wish it to be thought that these characters are in any way new to pomology (except in so far as bud colour is concerned), as DUHAMEL DU MONCEAU has used most of them in his descriptions, and ENGLEBRECHT in "Deutschlands Apfelsorten" uses the various forms of styles as dried in the fruit as recognition characters.

Season of Flowering.—It is not necessary to go into detail as to the relative flowering periods, as this matter has lately been dealt with in reference to pollination in this Journal (JOURNAL R.H.S. vol. xxxvii. p. 350), but it will be remembered that very considerable differences occur between the different varieties, and the relative positions of early, mid, and late flowering kinds is on the whole well kept in varying seasons.

It may be well, however, to direct attention to certain varieties which may be termed successional flowering varieties, in which the flowers expand in succession, thus ensuring that a better chance is given of avoiding a frosty period than with those varieties the flowers of which are nearly all open at the same time. Such "successional" varieties are 'Worcester Pearmain,' 'Cox's Orange Pippin,' 'Annie Elizabeth.'

Size and Shape of Flowers.—This is an obvious distinction and not of very much value in discriminating between two similar varieties, as, generally speaking, the size of the flower is correlated with that of the fruit. The shapes, however, of the petals afford a better ground, and the four most common types are illustrated in fig. 86. The shape of the expanded flower is characteristic, and may be described as cupped or flat. Those that are cupped do not, even at their maturity, lose this form, and representatives are 'Lady Sudeley' and 'Lane's Prince Albert.' Others open flat, or even in some cases the petal is forced back at less

than a right angle to the axis of the flower stem. Examples of the flat type are 'Peasgood's Nonsuch' and 'Gravenstein.'

The various petal forms are to be found in all sizes, but upon the whole the form shown at the top right of fig. 86 is general in the largest flowers. The smallest size shown is the 'Old Golden Pippin.'

Colour.—The colour of the expanded petal is very characteristic and is generally confined to the outside, but there are certain varieties in which a general suffusion is common to both sides. Such, for instance, is 'Golden Spire.'

The difference of colour is most prominent when the flower is in bud, and it forms an excellent recognition mark, and one to which we believe attention has not hitherto been drawn. The flower buds should be examined when about the size of a pea, and it will then be found that the colours are most distinct, ranging from a light yellowish pink (*Rép. des Couleurs*, Hydrangea Pink T_3) to the darkest carmine (Rouge Cramoisi, 114 T_1).

The value of this differentiating mark will be appreciated in the case of such easily confused apples as 'Pott's Seedling' and 'Grenadier,' and 'Lane's Prince Albert' and 'Striped Beefing.' In each case the first-named of the two pairs has very dark flowers and the second light. A further case may be mentioned in that of 'William's Favourite' and 'Worcester Pearmain,' apples of the same season and of often similar appearance. The widely different colours of the buds will make identification easy.

Calyx.—The size, shape, and woolliness are of course well observed in the fruit and we need not discuss them here, except to say that the differences are more easily seen in the flowering stage.

Relative Lengths of Pistil and Stamens.—This is a character of some value, and is, so far as our observation has gone, one of the most constant.

In fig. 87 a flower is shown from which the petals have been removed, and here the styles are almost double the length of the stamens. In fig. 88 the styles equal the length of the stamens, and in some few cases they are actually shorter. It should be observed that the stamens usually attain their maximum size first, and are generally dehiscing when the pistil has reached its full length. Examples of these variations are as follows:—

Styles longer than stamens—'Lane's Prince Albert,' 'Ormeade Pearmain,' 'Gravenstein.'

Styles and stamens equal—'Baumann's Red Winter Reinette,' 'Mother,' 'Lord Derby,' 'Golden Spire.'

Styles shorter than stamens—'Bramley's Seedling,' 'Sturmer Pippin,' 'Coronation.'

Various Style Forms.—Two well-defined forms exist, as may be seen by reference to figs. 89 and 90. In fig. 89 it will be seen that the styles are united, forming a column of half their total length. In different varieties of the same type the column may be longer or shorter, but it preserves on the whole a very constant length, and a

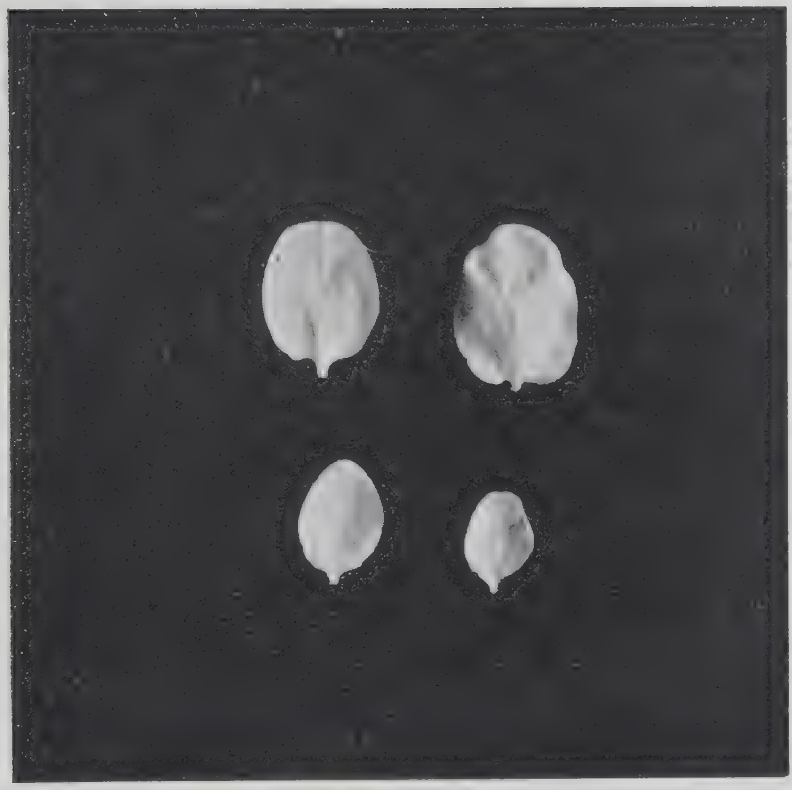


FIG. 86.—THE FOUR MOST COMMON TYPES OF APPLE PETAL.

[To face p. 236.

FIG. 87.—RELATIVE LENGTHS OF STAMENS AND STYLES IN APPLE 'WHITE TRANSPARENT.'

FIG. 88.—STYLES AND STAMENS OF EQUAL LENGTH.

FIG. 89.—STYLES FORMING COLUMN.

FIG. 90.—STYLES FREE TO THE BASE.

Fig. 91.—Styles Hairy Throughout.

measurement of fifty flowers in which the average length of column before division was 6½ mm., gave 5½ mm. as the shortest and 7 mm. the longest.

The second type has the styles divided to the base as in fig. 90, and the constancy of the form is even better maintained. The amount of pubescence is also a guide, though not so constant. In some varieties the whole pistil is quite glabrous, as in 'White Transparent,' in others small hairs are present at the junction, as in fig. 89. A third case is in fig. 91; the styles are hairy almost to their summits.

So far in the form in which they are divided to the base, we have not yet found a glabrous variety. It will be seen that taking the two types, columnar and separate, we have two very clear-cut differentiating characters. Examples of their utility are shown in the following cases, in which two similar fruits are compared:—

Styles divided to base.	*Styles forming column.*
'Cox's Orange Pippin.'	'The Houblon.'
'Forfar Pippin.'	'Norman's Pippin.'

Correlation.—The fascinating but dangerous task of searching for some broad and general correlation between these varying characters of apples is one at which we can only permit ourselves a hasty and hesitating glance. That large flowers indicate large fruit is frequently true, but exceptions exist. The largest flower we have noted is that of 'Nelson Codlin,' an apple of medium size. Colour in flower and fruit seems to go more by contrary rule, as the finest coloured flowers are generally those of pale yellow or green varieties, as in 'Lord Derby,' 'Forfar Pippin,' and 'Golden Spire.'

Lateness in flowering has on the whole a correspondence with lateness in the fruit, but by no means in all varieties.

The writer hopes that any departures from the facts stated above may be brought to his notice, as he has not had the opportunity of studying the possible effect of any markedly different environments upon them.

THE POLLINATION AND SETTING OF FRUIT BLOSSOMS AND THEIR INSECT VISITORS.

By Cecil H. Hooper, M.R.A.C.

[Read July 30, 1912; Mr. F. J. Chittenden in the Chair.]

Essentials for successful fruit-growing, such as good varieties, suitable soil, good cultivation, and the maintenance of the crop free from disease and insect pests, have long been carefully studied and practised, but the problems connected with the pollination and setting of fruit, which are of equal importance, have been less studied, and there is probably still far more to find out concerning them than is already known. Whilst frost at blossoming time is often calamitous to our fruit crops, especially if the blossoms are moist, yet, like the household cat, frost is in some cases blamed for damage of which it is not the cause.

Thus in some kinds of cherry a fungus attacks and causes the shrivelling up of the flowers, a result often wrongly attributed to frost, and frost is often blamed for the results of lack of efficient pollination.

The best natural safeguard to modify damage by frost is to ensure the blossoms being pollinated soon after they open, as it is an ascertained fact that a pollinated blossom is less susceptible to injury by frost than one that is awaiting pollination. Pollination in fruits is found to be almost entirely due to insects, wind, except with nuts, transferring pollen far less than one would naturally suspect.

Of course in order to have fruit there must be flowers, but I do not propose to go into the question here of how to persuade a barren tree to produce flowers.

Some varieties, although they blossom well, set very little fruit. Why this is, is the nut to crack. The cause does not appear to be due to any defect in the structure of the flowers, for the pollen grains and the stigmas are usually perfect.

Method of Pollination.

The *strawberry* in the field or garden appears to be able to set fruit well almost without insects, and probably in this fruit the wind carries the pollen over the flower.

The *raspberry* and *loganberry* will set some fruit with insects excluded; but the fruit is usually imperfect in shape, especially in the raspberry, and inferior to where it is open to the visits of insects. Bees are very fond of raspberries and still more fond of loganberries.

In *gooseberry*, *red*, *white*, and *black currants*, the pollen is globular and glutinous (like tapioca); wind cannot carry it, so it is necessary in order to have fruit that insects should transfer the pollen from the anthers to the stigmas.

All the plants just mentioned set their fruit perfectly with pollen of the same variety or plant.

In the case of fruit trees such as the *apple*, *pear*, *plum*, and *cherry*, we find fruit sets only very rarely when insects are excluded, and that many varieties will not set fruit with pollen of the same tree or variety; that in all, or nearly all, varieties one gets a larger proportion of fruit set if pollinated with a different variety; and lastly, that the trees have some degree of preference as to the pollen, pollen of a certain variety producing better results than with that of another variety.

Apples.

I believe Mr F. J. CHITTENDEN was the first in this country to test different varieties of apples and pears as to whether they will set fruit with pollen of the same variety or require to receive pollen from another variety in order to set fruit. During 1911 and 1912 I tried some 67 varieties of apple to see whether they would set fruit when insects were excluded by muslin or paper bags. The result was that only one variety set and matured fruit—namely, 'Irish Peach.' Of 67 varieties pollinated with pollen of the same variety, only 11 set fruit. Mr. CHITTENDEN out of 24 varieties found three set fruit with their own pollen; in Oregon, U.S.A., Messrs. LEWIS and VINCENT out of 87 varieties of apples classified 15 as self-fertile, 13 as partially self-fertile, and 59 as self-sterile; thus it appears that only about 1 in 5 varieties of apple will set fruit with its own pollen.

Mr. CHITTENDEN's list of *more or less self-fertile* apples includes 'Gladstone,' 'Stirling Castle,' 'King of the Pippins,' 'Early Victoria,' and 'Lord Grosvenor,' to which, from my trials, I would add 'Irish Peach,' 'White Transparent,' 'Newton Wonder,' 'Ecklinville,' 'Summer Golden Pippin,' 'Baumann's Red Winter Reinette,' 'Peasgood's Nonsuch,' 'Christmas Pearmain,' and probably 'Washington,' 'Adam's Pearmain,' 'American Mother,' and 'James Grieve.'

Mr. W. O. BACKHOUSE found 'Lord Derby,' and I think, 'Early Julian,' to be self-fertile, whilst in Oregon, U.S.A., 'Keswick Codlin,' 'Duchess of Oldenburgh' and 'Washington' are found self-fertile.

The list of apples that are apparently self-sterile includes 'Alfriston,' 'Allington Pippin,' 'Annie Elizabeth,' 'Beauty of Bath,' 'Beauty of Kent,' 'Belle de Pontoise,' 'Ben's Red,' 'Bismarck,' 'Blenheim Orange,' 'Brabant Bellefleur,' 'Broad-eyed Pippin,' 'Cellini,' 'Court Pendu Plât,' 'Cox's Orange Pippin,' 'Cox's Pomona,' 'Duchess's Favourite,' 'Egremont Russet,' 'Fearn's Pippin,' 'Golden Noble,' 'Golden Spire,' 'Graham's Royal Jubilee,' 'Grenadier,' 'Hambling's Seedling,' 'High Canons,' 'Hoary Morning,' 'Hollandbury,' 'King of Tompkin's County,' 'Lane's Prince Albert,' 'Lady Henniker,' 'Lady Sudeley,' 'Loddington,' 'Lord Suffield,' 'Mère de Ménage,' 'Old Hawthornden,' 'Old Nonpareil,' 'The Queen,' 'Ribston Pippin,' 'Rival,' 'Sandringham,' 'Seaton House,' 'Striped Beefing,' 'Sturmer Pippin,' 'Waltham Abbey Seedling,' 'Warner's King,' 'Williams' Favourite,' and 'Worcester Pearmain.'

With further trials in different parts of the country, some alterations may be necessary, but the lesson to be learned is that intermixing two or more varieties in an orchard or garden is advisable, as a larger crop is usually obtained where several varieties are intermixed.

Now as to the question of choosing of pollinizers. Out of 65 varieties I cross-pollinated, I had fruit set and mature on 48. The varieties to be intermixed should flower at approximately the same period. Therefore avoid planting very early blossoming kinds with very late blossoming, but rather plant early flowering kinds with early flowering or mid-season varieties, and late flowering sorts with late or mid-season flowering varieties. Mr. Chittenden has furnished us with excellent tables of the relative order of flowering of 235 varieties of apples in a contribution to the Journal R.H.S. xxxvii. (1911), p. 350, entitled "Pollination in Orchards."

If two or three varieties are to be planted in an orchard, better results will probably follow by planting first one row of one variety, then another row of a different variety, and so on, rather than planting in two or three large blocks each of one variety.

A bulletin on "Cross and Self Pollination of the Apple," issued by the Oregon Experiment Station, tells us that "all varieties do not cross satisfactorily with each other; when one variety was fertilized with pollen from a number of other varieties, distinct differences were found in the number of fruits set from the different crosses and in the average weight of the produce. The suitability of varieties for crossing is a matter of investigation, but it is pointed out that in planting different varieties together their pollen-producing qualities should be taken into consideration, as well as their commercial value, while it is important that they should come into blossom at about the same time, or at any rate their blossoming periods should overlap."

I tried 10 different pollens on a 'Cox's Orange' tree, but only had fruit mature from two—viz., 'High Canons' and 'Bramley's Seedling.' We want more knowledge on this subject of cross-pollination, with observation of the conditions where certain fruits yield well and observations where fruits yield badly, in order to try and ascertain the cause of the difference. The different varieties of Crab apple are by some people recommended as being good pollinizers for apples generally.

Pears.

In pears Mr. M. B. Waite in 1891 and 1892 found in the United States that out of 36 varieties, 14 were more or less self-fertile, while 22 were self-sterile, and that although a few varieties were quite productive with their own pollen, yet even with these self-pollination seemed less certain than cross-pollination.

Mr. F. J. Chittenden in 1902 and 1903 tested 15 varieties: of these only 2 proved self-fertile.

In 1911 I placed bags over unopened blossoms on 30 varieties of

pears to exclude insects: fruit set on 6 only, but all the fruits gradually fell before maturity. I also bagged and pollinated with pollen of the same variety 30 different varieties of pear: in these about the same proportion set fruit, but only 2 matured—viz., 'Duchesse d'Angoulême' and 'Colmar d'Eté,' that of 'General Todleben' falling early in July; whilst of 5 varieties cross-pollinated, all 5 set fruit.

More or less self-fertile pears.—Mr. CHITTENDEN found 'Conference' and 'Durondeau' set with own pollen; in my trials I found 'Duchesse d'Angoulême' and 'Colmar d'Eté'; in North America 'Duchesse d'Angoulême,' 'Beurré Bosc,' 'Beurré Diel,' 'Doyenné d'Alençon,' 'Flemish Beauty,' and 'White Doyenné' were found to be self-fertile, but it does not necessarily follow that varieties that are self-fertile in America are self-fertile in England.

Varieties found apparently self-sterile.—Mr. CHITTENDEN, in 1902 and 1903, found fruit not to set with its own pollen with 'Beurré d'Amanlis,' 'Beurré Superfin,' 'Catillac,' 'Doyenné du Comice,' 'Easter Beurré,' 'Emile d'Heyst,' 'Jargonelle,' 'Josephine de Malines,' 'Louise Bonne of Jersey,' 'Williams' Bon Chrétien,' 'Olivier de Serres,' 'Bellissime d'Hiver' and 'Pitmaston Duchess'; the last two varieties in the second year did, however, set one fruit out of eighteen trials and one of twelve respectively. In my own experiments the varieties that did not set and mature fruit with their own pollen were 'Beurré Diel,' 'Beurré Superfin,' 'Catillac,' 'Citron des Carmes,' 'Clapp's Favourite,' 'Conference,' 'Marie Louise,' 'Louise Bonne of Jersey,' 'Pitmaston Duchess,' 'Souvenir du Congrès,' 'St. Luke,' 'Uvedale's St. Germain,' and 'Williams' Bon Chrétien.' My trials consisted in most cases of only one bag on each variety, so need repetition for confirmation.

In the United States 'White Doyenné' and 'Clapp's Favourite' have proved themselves good pollinizers for 'Williams' Bon Chrétien.' In the case of 'Vicar of Winkfield' I pollinated four buds with pollen of 'Winter Crasanne' and had two fine pears as the result, the best on the tree. This spring a lady told me that in her garden was a fine wall-trained pear tree which, although it blossomed well each year, never carried fruit. I gave her several bunches of pear-flowers of two varieties which were then open, and a camel's-hair brush to dust the open flowers with pollen of the flowers I had given her; this she did, and there is now an excellent crop, apparently due to this artificial cross-pollination.

I think an amateur interested in fruit, with a short time devoted to it, might be well repaid in this cross-pollination of pears, especially in windy ungenial weather, when insects are not attracted out. The work is quickly done and shy bearers would very likely be persuaded to fruit.

These trials show very markedly the importance of the visits of insects and of intermixing varieties.

In a bulletin issued this year by the United States Department of Agriculture, entitled "The Pear, and how to grow it," by G. B.

Brackett, Pomologist, Bureau of Plant Industry, Farmers' Bulletin 482, it is said: "Some varieties of pear are infertile by themselves and therefore varieties should be intermingled in planting in order to ensure fruitfulness. No more than two rows of one variety should be planted together, alternating with some other variety that is considered a good pollinizer." Then follows a list of varieties found more or less self-sterile and those found generally fertile. He further states that self-fertile varieties under some conditions may become self-sterile under other conditions.

It is desirable to take some note of the relative order of flowering of pears for cross-pollination.

Mr. C. J. Lewis says that in Oregon 'Williams' Bon Chrétien' and 'Beurré d'Anjou' intercrop very well, also 'Winter Nélis' with 'Doyenné du Comice,' but 'Williams' Bon Chrétien' and 'Beurré Bosc' were found not to inter-pollinate with good results.

'Beurré Clairgeau' is a prolific early flowering variety that might be tried as a pollinizer for early varieties, whilst 'Clapp's Favourite' would probably prove a good pollinizer for late flowering kinds. It is found to be a good pollinizer in the United States.

Plums.

Out of 13 varieties I tried, only 3—'Victoria,' 'Czar,' and 'Bullace'—matured fruit when not pollinated. Of 12 varieties pollinated with their own pollen, 6 varieties set and matured fruit—viz., 'Victoria,' 'Czar,' 'Denniston's Superb,' 'Bittern,' 'Monarch,' 'Bullace,' and 'Rivers' Early Prolific.' Out of 10 varieties cross-pollinated 7 set fruit.

Mr. W. O. Backhouse, who has made very careful experiments on this subject at the John Innes Horticultural Institution, at the annual meeting of the National Fruit Growers' Federation stated that he found the following 9 plums:

Self-fertile.—'Victoria,' 'Prince Engelbert,' 'Czar,' 'Pershore,' 'Yellow Magnum Bonum,' 'Damson var.,' 'Denniston's Superb,' 'Early Transparent,' 'Reine Claude Violette.'

And the following 12 plums:

Self-Sterile.—'Histon Gage,' 'Early Orleans,' 'Late Orleans,' 'Sultan,' 'Kirke's Blue,' 'Coe's Golden Drop,' 'Washington,' 'Late Transparent,' 'Blue Impératrice,' 'Early Greengage,' 'Old Greengage,' and 'Reine Claude d'Althan.'

He remarks that among plums on the whole the self-fertile varieties correspond with the best croppers; but it is not always so, for 'Rivers' Early Prolific,' which is a great cropper, is very nearly self-sterile, settling, in his trials, little more than one per cent. of its flowers when self-pollinated. In addition to the varieties above mentioned, in my trials 'Cox's Emperor,' 'July Greengage,' 'Greengage,' 'Black Diamond,' 'Pond's Seedling,' 'Bradley's King of Damsons,' and 'Jefferson' proved self-sterile.

The greengages are very frequently found shy bearers, though they blossom well; this may be due to some peculiarity in pollination; for in the beautiful fruit garden of Olantigh, near Wye, where the owner, Mr. W. S. Erle-Drax, has kindly allowed me to make my trials, the various varieties of greengage are crowded with fruit, and Mr. Bond, the gardener, tells me it is so yearly. The trees are fan-trained against a high wall, and there are several different varieties of greengage planted near together; there are also four or more hives of bees in the garden. I know a group of about 6 large greengage trees about a mile distant that for five years have hardly borne a fruit. I think they are all of one variety, and bees are at a greater distance.

In California, 'Coe's Golden Drop' is found to fruit better when interplanted with 'Satsuma,' a Japanese plum.

Summary of Pollination Experiments made at Wye, Kent, in 1911 and 1912

Fruit	Insects excluded		Pollinated own pollen		Pollinated foreign pollen	
	Number of varieties tried	Number in which fruit matured	Number of varieties tried	Number in which fruit matured	Number of varieties tried	Number in which fruit matured
Cherry .	13	0	12	5	12	8
Plum . .	11	2	12	6	10	7
Apple . .	67	1	67	11	65	48
Pear . .	30	0		2	5	5

Cherry Pollination Trials made in the Orchards of Mr. Robert Amos at Wye in 1912.

Variety	Insects excluded	Pollinated with own pollen	Cross-pollinated with	Cross-pollinated	Remarks
'Rivers' Early Black' .	0	0	× 'Black Heart' and 'Elton'	0	Crop light, cherries single
'Knight's Black' .	0	0	× 'Black Eagle'	F_2*	Fair crop
'Black Eagle' . .	0	0	× 'Black Heart' and 'Knight's Early'	F_3	Excellent crop
'Kentish Flemish' .	0				Short crop; old tree
'Amber Bigarreau' .	0	0	× 'Black Heart'	F_1	Good crop
			× 'Turk'	F_4	Good crop
'Elton Heart' . .	0	0	× 'Frogmore'	F_3	Fair crop
'Early Frogmore' .	0	0			
'Rundles' . . .	0	F_1	× 'Amber Bigarreau'	0	Very good crop
'Turk'	0	F_2	× 'Napoleon'	F_7	Good crop
'Napoleon'. . .	0	F_3	× 'Waterloo'	F_5	Very good crop
'Waterloo'. . .	0	0	× 'Amber Bigarreau'	0	Poor crop
'Morello' . . .	0	F	Trials on wild 'Morello' in 1911	F	Plentiful crop

Results:—Out of 13 varieties, insects excluded, 0 set and matured fruit.
Out of 11 varieties pollinated own pollen, 4 set and matured.
Out of 11 varieties, 8 set and matured fruit.

* The small number below F indicates the number of fruits produced.

Cherries.

In 1911 I made trials in an orchard the tenant of which did not know the names of the varieties when in flower. I chose what I considered to be 9 different varieties. No blossoms set fruit where insects were excluded and no pollination was done; of nine different varieties pollinated with their own pollen none set fruit save the 'Kentish Morello' (a small variety of Morello cherry that comes true from seed) and 'Florence,' whilst each variety when pollinated with pollen of another variety set fruit. A good many were pollinated from this semi-wild Morello cherry.

In 1912, Mr. Robert Amos, of Perry Court, Wye, most kindly gave me the use of his large cherry orchards for experiments.

In trials this year 'Napoleon,' 'Turk,' 'Rundles,' and 'Morello' proved themselves self-fertile, whilst 'Rivers' Early Black,' 'Knight's Black,' 'Black Eagle,' 'Amber Bigarreau,' 'Elton Heart,' 'Early Frogmore Bigarreau' were self-sterile, but some of these may on further trial be found to set fruit with their own pollen. It is advisable in such trials to choose the unopened buds in the most favourable position for fruit setting.

Peaches and Nectarines.

In trials on several trees of different varieties those that were cross-pollinated seemed to start off best, but, being on wall-trees in the open, frost ruined the crop and upset my experiments.

Insect Visitors to Fruit Blossoms.

From observations in 1911 and 1912, it seems to me in districts where hive bees are in the neighbourhood the relative value in pollination of fruits of the different insects is, roughly, 80 per cent. due to hive bees, 15 per cent. due to the various bumble bees, and the remaining 5 per cent. due to other wild bees, ants, tiny beetles, and flies.

It is to be remembered that at the blossoming time of our fruits, particularly at the beginning, there are few insects about except hive bees and bumble bees, which hibernate and so are ready for work early in the year. These insects have hairy bodies and tongues specially adapted to transferring pollen, also by habit they are busy going from flower to flower of the same variety collecting pollen and nectar; whereas some of the insects only sip the nectar or seem merely to play with the flowers; whilst other insects (as weevils and other beetles) eat the pollen and other parts of the flower and move but little from flower to flower. In the case of fruit-trees, many of these insects move very little from tree to tree, and consequently are useless as pollinizers on self-sterile varieties. Very strong wind and rain stop insect visits to a great extent, and if there is much of this unfavourable weather whilst the plant is in flower it very much affects the quantity of fruit, especially in a district in which there are few pollinizing insects.

SUMMARY OF INSECTS SEEN ON FRUIT-BLOSSOMS AT SIDMOUTH, DEVON, AND WYE, KENT, IN 1912 BY C. H. HOOPER.

Fruit	Hive bees	Bumble bees	Other wild bees	Wasps	Bluebottle flies	Other flies	Ants	Beetles	Other insects	Dates of observation
Peach, Nectarine	...	2	...	...	...	...	...	1	2	March 14–April 1
Plum	6	3	1	...	...	...	...	...	...	March 29–April 30
Gooseberry	40	...	...	1	...	...	...	...	...	April 3–May 2
Cherry	31	13	1	...	...	...	...	...	1	March 30–April 25 (1 spider)
Pear	159	1	4	2	14	1	...	...	3	April 11–25 (2 midges, 1 white butterfly)
Black-currant	22	10	4	...	...	...	...	...	1	April 19–27
Red-currant	10	...	1	...	1	...	...	...	...	April 19 and 20
Apple	221	20	5	...	...	8	23	21	6	April 19–May 11 (5 midges, 1 spider)
Quince	4	...	...	...	...	...	...	...	...	May 1–10
	493	49	16	3	15	9	23	22	13	Total 643

INSECTS OBSERVED ON BLOSSOMS OF STRAWBERRY, LOGANBERRY, AND RASPBERRY BY MR. H. C. CHAPELOW IN THE PLANTATIONS OF WYE COLLEGE, KENT, IN 1912. (Bees close, within $\frac{1}{8}$th mile.)

Blossoms of	Hive bees	Bumble and other wild bees	Flies and other insects	Notes
Strawberry	Practically no insects			Area $\frac{1}{8}$th acre close to hives; many varieties of strawberry
Loganberry	1,292	61	79	Between May 19 and 30, on 15 plants observed daily at 11 A.M. and 2 P.M.; rather more insects seen in morning than in afternoon generally
Raspberry	797	32	24	Between May 21 and 30, on a row of 12 yards run, observed daily at 11 A.M. and 2 P.M.
Total	2,089	93	103	
Add record on Apple, Pear, Plum, Cherry, Gooseberry and Currants by C. H. Hooper	493	65	85	Short daily observations in Devon and Kent. Recorded in gardens and orchards $\frac{1}{4}$ to 1 mile from hives of bees. The other insects include ants and beetles
Gross total	2,582	158	188	Bees (hive and bumble) by their habits in visiting from flower to flower and by reason of their furry coats are much better pollen carriers than flies, beetles, or ants
Percentage of insect visitors	88%	$5\frac{1}{2}$%	$6\frac{1}{2}$%	

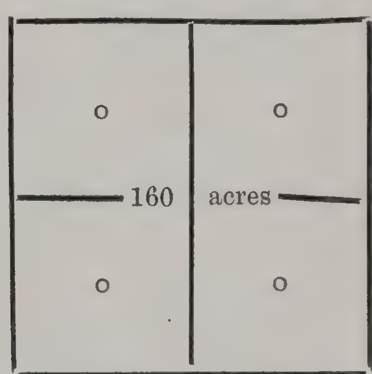
We cannot well encourage bumble bees, but we can place hives of bees in orchards and plantations, in order to have bees on the spot for work in the fine intervals, and their work undoubtedly makes orchards, fruit plantations, and gardens more fruitful and more regular in bearing. The latter is a fact of great importance.

The natural balance of pollinizing insects for flowers is upset in two ways:—

(1) In towns and suburbs, buildings, close cultivation, and the grubbing up of hedge banks (in which bumble bees live), all lessen the number of insects. Hive bees are specially to be recommended. Mr. W. F. Reid tells us that it is not smoke that prevents fruit-setting in towns, but the absence of pollinizing insects.

(2) In large fruit-growing districts, especially if the land is closely cultivated, the proportion of bumble and other wild bees is out-balanced by the amount of work they have to do, and hive bees should be kept. A recent Australian Government Agricultural Journal recommends one colony of bees to each two acres of fruit, or on a 140-acre farm 70 hives in groups of 10 or 15 hives in a spot placed at advantageous points. Spraying and cultivation close to the hives might be left until late in the evening to avoid discomfort, or veils might be provided as a protection.

Being interested to get information as to the proportion of bees recommended for fruit-growing in England, I asked the Secretary of the British Beekeepers' Association, Mr. W. Herrod, his opinion in the disposal of beehives on a fruit farm. He recommended on 160 acres placing the apiary either in the centre, or preferably dividing it into four groups of 10 hives at each spot thus:—



Bees are said to fly a mile away from their hives on warm sunny days, but on cold cloudy days they limit themselves to 100 yards. It is important to have the hives strong in spring ready for work.

Bumble bees work on rather later in the evening than hive bees, and come out in somewhat less favourable weather, but their number is not generally very large.

Unless methods of prevention or cure of the "Isle of Wight Bee Disease" can be found and put in practice, it looks as if it would in a very few years have a most disastrous effect on fruit-growing, even surpassing the loss due to American Gooseberry Mildew, Black Currant Bud Mite, &c., and ruinous if it also attacks wild bees.

Germination of Pollen.

The study of this subject is of importance. E. P. Standsten found in Wisconsin in connexion with this work that although sunshine considerably increases the setting of the fruit of tomato it has little effect on apples and plums.

Temperatures a little below freezing point were found not to be injurious to the pollen of apple, pear, and plum, though in the case of the cherry and the peach about one-half of the pollen failed to germinate after exposure to slight frost.

The pistils of apple, pear, plum, and cherry prove more susceptible to low temperature than does the pollen; so that a severe frost will kill the pistil, while it may not injure the pollen to any degree.

It is often thought that the juice of the stigma becomes diluted and washed off during heavy and prolonged rains. Observations appear to show, however, that the stigma is not seriously injured by rain, though prolonged rain prevents the proper dispersion of pollen during the period of receptivity of the stigma, which lasts only for a few days.

Comparing pollen of apple from a long-neglected orchard with one well cultivated, it was found that pollen of the former lacked plumpness, regularity, and size, as compared with pollen from the other orchard, and the length of time the pollen grains took to germinate indicated a lower state of vitality. The size of the flowers in the neglected orchard was much smaller, and the stamens and pistils were dwarfed and deformed in many cases.

Apple pollen was found to germinate after six months when kept in a dry place at a temperature of between 50° and 65° Fahr. The length of time that plum pollen retained vitality was less, but, generally, it would seem that pollen can be safely transported and kept for some time without any very noticeable effect upon its germination.

Under favourable conditions it was found to take from 9 to 32 hours for the pollen tube of apples, plums, and cherries to reach the ovary when placed on the stigma or in germinating medium.

Cherry pollen required a little over twelve hours.

Under natural conditions the time would be somewhat greater, but two or three bright, warm days at the time of full-bloom is sufficient for the setting of the fruit.

These trials show that the danger period from frost is comparatively short, and account for the fact that often a frost during full-bloom apparently does very little damage, while at other times a similar frost may completely kill the essential parts of the flower.

Summary and Suggestions for Experiments on Pollination of Fruits.

It seems as if in the open field or garden strawberries are pollinated by the movement of the air. Raspberries and loganberries need insect pollination. The raspberry is more dependent on insect pollination than the loganberry. Hive bees are very fond of raspberry blossoms, and even more so of those of loganberry. In gooseberries and currants it is of the utmost importance to have plenty of hive or bumble bees near, as no fruit is set without them. They are also a necessity in the case of pear, apple, cherry, and plum.

As to pollination experiments on pear, apple, cherry, and plum, it seems to me it would be advantageous to test in, say, the ten chief

fruit-growing districts, or in each county, to find out which varieties are self-sterile and which are more or less self-fertile. With regard to self-fertility, roughly speaking, if one blossom out of six were to set, that would give sufficient crop—*i.e.*, 16 per cent. We want to know approximately the relative self-fertility, as if only one blossom in 1,000 set, it is for practical purposes self-sterile.

Then we want information as to what varieties are good pollinizers for our best pears, apples, plums, and cherries.

It would be of interest to note how long individual flowers of the different kinds of fruit remain open, and in self-fertile varieties to ascertian whether the result is identical, whether the pollen it is fertilized with is of the same flower, the same tree, or a distant tree of the same variety.

Experiments in the pollination of fruits have the advantage of being inexpensive in material (muslin or paper bags, brush or forceps, methylated spirit, labels, notebook), and could be carried out by botanists, fruit-growers, or gardeners.

With our present knowledge it seems advisable in planting to alternate the variety in each one or two rows, choosing varieties that blossom at about the same period.

In gardens do not plant single trees of a kind, all trees of one variety together, but rather intermix the varieties.

Keep hive bees, especially in suburban gardens and on large fruit-farms, and in districts where large areas of the same kinds of fruit are grown.

PRESENT-DAY WATER LILIES.

By J. Hudson, V.M.H.

[Read August 27, 1912; Mr. E. A. Bowles, M.A., in the Chair.]

Their Hardiness.—I cannot speak positively, but I think I may safely say that twenty years have scarcely elapsed since the earliest of the many hybrid Water Lilies was first introduced to commerce. Even at the present day many horticultural enthusiasts, well conversant with plants in general, seem not to recognize the fact that the race of hybrids, raised chiefly by the late Monsieur B. Latour-Marliac and later by his son Monsieur C. Latour-Marliac, by Monsieur Froebel, of Zurich, and by some American hybridists, are hardy, but such is the case. True, there are several hybrids of *Nymphaea stellata* (syn. *N. coerulea*) and of *N. zanzibarensis* that have been put into cultivation that are not hardy. We have yet to raise, or find, a blue Water Lily that will be quite hardy in Great Britain generally. I have been led to make these remarks from the questions put to me by visitors when inspecting the fine collection of Water Lilies upon the open water or lake at Gunnersbury got together by Mr. Leopold de Rothschild, C.V.O., who takes such great interest in them.

Their Various Uses.—It is surprising that their cultivation has not become more general than it has. We have now, thanks almost entirely to the enterprise of the Marliacs, a race of hybrids of great vigour and of undoubted hardiness. They are fit for large sheets of water and may be planted, if needs be, in quite 9 or 10 feet of water. Then, we have others well suited to shallow lakes or pools; and yet again, others better suited for fountains and shallow basins of water.

Their Characteristics.—The more we grow Water Lilies, the more we become, so to speak, familiar with them. That they provide us with most attractive flowers during their season is beyond dispute. It was to be expected that in due process of time some features would be evolved that would add to their attractiveness in other directions than in their singularly beautiful flowers. We have now an extended season of flowering, as is to be seen in *Nymphaea virginalis*, which flowers early and late. The earliest flowers were fully developed early in April, the latest I shall expect to see, as last year, late in October. I have also noted that many of these hybrids remain open later in the afternoon; this is a distinct advantage too. During the past few weeks of dull and often sunless weather there have been numbers of flowers open late in the day; most noticeable in this respect was *N. tuberosa* var. *Richardsoni*, with its pure white blossoms and its multiplicity of somewhat narrow petals. During September I have noted repeatedly that the blossoms remain open even as late as ten o'clock in the evening. It is most interesting to see some of the brightest coloured varieties during a clear moon-

light evening when they glisten like gems upon the water's surface. Fragrance has also been imparted to many of the larger flowering hybrids, as a result no doubt of intercrossing with *N. odorata*. Some of the hybrids have beautifully mottled or marbled foliage, others are suffused with varied tints of bronze upon the leaves. In some of the newer hybrids there is an additional sepal, as in the case of *N. gloriosa*. This allows of slightly more expansion of the blooms, and is a distinct attraction. Anyone who may have seen *N. gloriosa*, when fully expanded, will have observed this characteristic feature. There is now in the possession of M. LATOUR-MARLIAC another most noteworthy hybrid not yet in commerce. It has flowers of the largest size with somewhat narrow petals, after *N. tuberosa Richardsoni*, but with as many as a hundred in one individual blossom. It is of a faint blush-pink colour, and I have no hesitation in saying that when it is distributed it will prove to be one of the most attractive.

Their Varied Styles of Growth.—In habit of growth there is considerable diversity. Some there are that possess remarkable vigour; these, except they be in deep water, require to be divided every four or five years, otherwise they will become very dense in growth. In this way the foliage is forced above the water and the flowers remain hidden underneath. These varieties should always be allowed plenty of room for development. They include *N. Marliacea albida*, *N. M. chromatella*, *N. M. carnea*, *N. M. rosea*, *N. colossea*, *N. Mooreana*, *N. somptuosa*, and *N. Gladstoniana*. Others there are that are also vigorous growers, but which are not so dense in the leaf development as the preceding. These may remain undisturbed for a longer period with advantage—such for instance as *N. gloriosa*, *N. Ellisiana*, *N. virginalis*, *N. lucida*, *N. tuberosa* (in its various forms), *N.* 'Mrs. Richmond,' *N.* 'James Brydon,' and *N. formosa*. Others are more suitable for shallow waters, say 2 to 2½ feet or so in depth. Among these are *N. sanguinea*, *N. ignea*, *N. Robinsoniana*, *N. atropurpurea*, *N.* 'Wm. Falconer,' *N. Froebelli*, all of the *N. odorata* and *N. Caroliniana* sections, *N.* 'Escarboucle,' *N.* 'Meteor,' and *N. Seignoureti*. Those of small or pygmy growth are not numerous—they include those of the *N. Laydekeri* section which are extremely beautiful and very floriferous; *N. pygmaea helvola*, *N. odorata pumila* and *N. pygmaea rosea*; for shallow fountains these are most useful and also for small pools of water amidst rockery and similar surroundings. With such a choice as the foregoing, it should not be difficult to select varieties suitable for every kind of water.

Their Increase by Division or from Seed.—I have not, so far, been successful in raising any distinct novelty at Gunnersbury in the open water. A few seedlings are appearing this season—the result, no doubt, of the heat of last summer. I have one plant that has been raised from seed of *N. Laydekeri rosea*; this is true to the type, however, and is one of the most beautiful, I think, of all the smaller varieties. It is not, unfortunately, easy to propagate, as no offsets are obtainable—at

least, such is the case with us. I saw recently some seed floating upon the surface of the water, but unfortunately it escaped my memory to skim it off before it sank to the bottom. The seed of the *Nymphaea* usually floats for about twenty-four hours after the capsule has burst and discharged its contents; then it sinks to the bottom, usually floating to the sides in shallow water; here it should be looked for in May of the following year as seedlings. If secured, however, it should be sown at once in a gentle heat and be kept growing all the winter. Sow the seed on mud and cover with about two inches of water, using shallow pans for the purpose. All of the vigorous growers can be easily propagated by offsets. These may be cut away clean from the main stem, if possible, with a few roots attached thereto. The work of propagation should be done early in the summer—May and June being the best times to see to it. If the divisions be small it will be well to keep them for a time in shallow tanks, where attention can be easily given to them. I would pot them into small or fairly small pots, unless the growth be quite vigorous and the roots plentiful. When such is the case place them at once into small baskets, properly secured, and sink them for the first season in shallow water, and in the warmest, most sheltered spot, but not in any shade whatever. Shade is not desirable at any period of growth, and the drip from trees overhead is certainly a disadvantage at any time.

Their Preference for Still Waters.—The *Nymphaeas* have a decided preference for still waters, or where the movement is of the slightest. I have watched for them on various occasions when on my holidays, but have never, in any instance, found them where the waters were much on the move. I saw them once on the Rhine, but it was in a sheet of water that was almost surrounded by land, where no perceptible motion was felt. I have noted them, too, on the lakes in Norway, but close to the water's edge. It is almost useless to grow them in running streams where such pass through the gardens; they are not at all congenial to their growth. In its native habitat *Nymphaea gigantea*, the blue Lily of Queensland, thrives, so I have been informed by a lady who has travelled there, in the lagoons where the water is comparatively still. Here also was found the Lotus (*Nelumbium speciosum*). *Nymphaea Lotus* thrives amazingly in the channels in the delta of the Nile that supply water for irrigation purposes for the cotton and other crops, but not in the river proper. I have upon various occasions had questions sent to me with respect to the failure of Water Lilies to thrive satisfactorily. I have, upon inquiry, invariably found that running water was the cause of non-success. If running water can in some way be modified by forming what may be termed backwaters, it is possible to succeed. In such positions the water will be slightly warmer, and this is a distinct advantage.

Their Floral Beauty.—When grown in masses, and where it is possible to view them from slightly elevated ground as at Wisley, at Gravetye, and elsewhere, the floral effect is extremely beautiful. For effect it is hardly possible, I think, to find anything in the way of

flowers more pleasing than large masses of *Nymphaea Marliacea albida*, *N. M. rosea*, *N. M. chromatella*, *N.* 'Jas. Bryden,' *N. atropurpurea*, *N.* 'Wm. Falconer,' *N. Froebelli*, *N. colossea*, *N. Ellisiana*, and *N. gloriosa*. These all have distinctive features, save in the case of *N. atropurpurea* and *N.* 'Wm. Falconer,' which somewhat resemble each other. All of them are most floriferous, and the colour effect they produce is most pleasing. Later on, when *N.* 'Escarboucle' and *N.* 'Meteor' become more plentiful they will add yet further attractions. Of the smaller varieties a lovely scene is produced when *N. sanguinea*, *N. ignea*, and *N. Laydekeri rosea* are grouped near to such aquatic plants as *Typha latifolia* and then viewed from the opposite side of the water with the *Typha* as a background. The variation from day to day adds also to the attractive features of these Nymphaeas; one day it may be a mass of white blossoms, another one of yellows, another of pink ones, another of deep rosy pinks, and another of crimsons. I am disposed to think that Water Lilies never look so beautiful as they do after a shower of rain, or even during a damp, drizzling day. We find occasional showers most beneficial in keeping the leaves clean. During a long period of dry weather the dusty deposit upon the leaves detracts somewhat from their beauty in our case. (At the present moment, whilst making these notes, it is raining here and the Lilies look at their best, the blue varieties in the open-air and warm tank being especially beautiful.)

Insects and Diseases.—Of insect pests the Black Fly is certainly troublesome, and this season it has been particularly so in our case. I have noticed, however, that the Moor-fowl which frequent our lakes have been paying attention to this pest. I am pleased to be able to say something in favour of these birds, for hitherto I have looked upon them as enemies, at least to some extent. As a remedy for the fly, I think nothing in the way of an insecticide is better or safer than a strong solution of Quassia extract—say one to eighty of *rain* water. This should be applied over the entire surface of the leaf growth. In order to reach the under surface of the leaves, all that one has to do is to hold the nozzle under the water, but as close up under the leaves as possible. An ordinary syringe will answer the purpose if in expert hands, and with a pair of waders, in order to get close to the plants, will be a great advantage. I just referred to the Moor-fowl. The fault I have to find with this bird is its propensity to make its nest upon the Water Lilies, choosing a fairly good-sized plant for this purpose. But in selecting materials for the nest the leaves of the newer kinds are their special choice, for what reason I cannot explain, unless it be that the foliage is more attractive from point of colour, as the bird selects the bronzy-leaved kinds in particular, and such leaves as are floating upon the surface. Needless to say, this practice is severely discouraged. There is a water-snail that in some instances causes trouble; for this I think nothing is better than finely granulated lime applied before the plants start into active growth. The lime, of course, soon loses its properties,

FIG. 92.—NYMPHAEA FORMOSA.

[To face p. 252.

FIG. 93.—NYMPHAEA 'CONQUEROR.'

but it is, I think, the best remedy we have. The worst trouble results, I am of opinion, from the attack made by a water Beetle. I am not an entomologist, therefore I am not prepared to give the name of this pest, or a specific remedy. All I advise is an occasional spraying in extreme cases with a moderately strong solution made up from an insecticide in which nicotine predominates. There is also another trouble in store for the growers of Water Lilies: it is the vole, or what is sometimes called the water rat. This is an undoubted nuisance, and wherever any exist, both trapping and the gun should be resorted to. Water-fowl, including all of the Duck family, the Swans, and other aquatic birds, are beyond any question the cause of frequent injury. I have had occasion to watch the injury done, and have noted that the heart, or leader of the plant, is aimed at, and sometimes pecked out, thus causing irretrievable injury. Where water-fowl exist to any extent, it must be bad for the Lilies. For the past three or four seasons we have failed with those lovely varieties of *N. odorata* which at one time did so well. *N. odorata exquisita* and *N. o. rosacea*, and also, I am sorry to say, *N. o. sulphurea grandiflora*, have all failed. They commenced to decline after we lifted them and divided them for stock purposes. I think the *N. odorata* section should not be divided or disturbed more than is actually necessary.

New Varieties of Hybrid Nymphaeas.

Nymphaea 'Mrs. Richmond.'—This is a decided acquisition in every respect; in colour it is a pale pink, deeper at the base of the petals, which are quite broad and massive; it has yellow stamens, and the flowers are of the largest size. We have had flowers this season quite 9 inches in diameter, and they are freely produced. It has been greatly admired this summer. In many respects it resembles *N. Laydekeri rosea* in colour, but it is much finer in every other way. When exhibited in August 1911 it received an Award of Merit.

N. formosa.—This is of a deeper shade of pink than the preceding, with the colour suffusing the flowers throughout; these are even larger than the first-named variety. This summer it has flowered very freely. It received an Award of Merit in July of this year. This, and the preceding, are two of the finest clear pinks in cultivation at the present time. (Fig. 92.)

N. colossea.—Its name denotes one of its most noteworthy characteristics; it is a remarkably fine flower, and is quite a major variety of that beautiful Lily *N. Marliacea rosea.* In addition it has an extended season, from early spring until the end of October. So far as I have observed, its size surpasses that of any other variety.

N. somptuosa.—This almost rivals the preceding in point of size; in colour it is a combination of rose, shaded with carmine. The flowers are somewhat incurved, and the growth is compact but vigorous. In every respect it is quite distinct. I am under the impression that we have not seen it at its best.

N. suavissima.—In this variety there seems to be a trace of *N. odorata* in the colouring, a bright rose-pink, quite distinct amongst all others on the water. In addition, it is sweetly scented; this, I think, confirms my suspicion of its affinity to *N. odorata*; in its form, too, there is the same tendency with somewhat narrow petals.

N. 'Newton.'—This very distinct variety bears some resemblance to *N. stellata* in shape. It flowered well in 1910, but has not done so well since with us. The flowers stand above the foliage; these in colour are rosy-vermilion with long orange-coloured stamens. In point of size it rivals 'Mrs. Richmond.' We shall see this finer when the plant becomes stronger.

N. 'Masaniello.' This variety is sweetly scented, but in form it has no semblance of *N. odorata*; in colour it is rosy-carmine with venations of a deeper shade. The flowers stand well above the water and are somewhat globular in shape.

N. 'Escarboucle.'—This is a most remarkable variety from point of colour alone. We have none upon our waters that can approach it. In its intense vermilion shade it is unique, the colour being uniform throughout the petals. It is a really magnificent variety, and one that will be much sought after. So far I have not been able to exhibit it before the Floral Committee in consequence of the flowers not being quite fit on the meeting days. It is a good grower and flowers freely.

N. 'Meteor.'—This has a ground colour much like the preceding, but with white venations through the petals; the golden-yellow stamens are quite conspicuous. The flowers are also quite large.

N. 'Attraction.'—In this new and very interesting variety the predominating colour is a deep purplish crimson with light, almond-white venations. It is readily distinguishable upon the lake, being so bright and attractive in every way.

N. 'Conqueror.'—This Water Lily has been greatly admired both last season and this. In colour it is a bright coral-red with darker red suffusions, and has, in addition, dark orange-yellow stamens. It is a most distinct Lily, with robust growth, and quite easily distinguished from other kinds. This variety received an Award of Merit in July last. (Fig. 93.)

N. virginalis.—I have already alluded to this most distinct and *pure* white variety. It is quite distinct from *N. Gladstoniana* and from *N. M. albida.* The petals are much broader than in either of these, and are of shell, or incurved, shape. I have already mentioned its earliness and its late-flowering properties; in addition, it is sweetly scented.

This dozen, so far as I have tried them at Gunnersbury, are, in my opinion, some of the very finest that M. LATOUR-MARLIAC has raised.

The Blue Nymphaeas.—I only purpose to say a few words upon these. Their cultivation is compartively easy. Two of them can be grown in the open air, provided the water be warmed slightly at the commencement of growth in the spring, 70° to 75° being ample. In

hot weather no artificial heating is necessary, but during such a period as the present (dull and sunless) a slight warmth is beneficial. Our tanks are chiefly arranged on the western side of a range of houses, where a connexion with the pipes therein was easily made, and really no very perceptible amount of extra firing is ever needed to keep the water at the temperature indicated. Those to which I now refer are *N. stellata*, Berlin var., and *N. pulcherrima*. The latter is the more vigorous of the two, and will, if warmth be afforded during the winter, flower almost perpetually. In 1910, during May, I put one plant of *N. stellata*, Berlin var., into the open lake as an experiment. It flowered fairly well, and, much to my surprise, it remained alive all the winter without any protection whatever, and grew and flowered fairly well again in 1911; but the winter of 1911-12 was too much for it. I have found both keep safely through the winter in a minimum temperature of 55° F. The other variety—*N. gigantea* var. *Hudsoniana*—was raised at Gunnersbury some years back. It requires slightly more warmth than the other two—say, 5° more. It is sometimes difficult to start into growth in the spring, the young tubers making a few leaves and then refusing to be coaxed into the flowering stage. When in flower, it is the finest blue in cultivation.

The following Nymphaeas have, at various times since July 1895, received either first-class certificates or awards of merit from the Floral Committee of the Royal Horticultural Society:—

Hardy varieties:

White—*N. Marliacea albida* and *N. Gladstoniana*.

Yellow—*N. M. chromatella*, *N. Mooreana*, and *N. odorata sulphurea grandiflora*.

Pink, shades of—*N. Laydekeri rosea*, *N. M. carnea*, *N. M. rosea*, *N. odorata rosacea*, *N. o. rubra*, *N.* 'Mrs. Richmond,' and *N. formosa*.

Red, shades of—*N. Ellisiana*, *N. gloriosa*, *N.* 'Jas. Brydon,' *N. Laydekeri fulgens*, *N. M. flammea*, *N. M. rubro-punctata*, *N. Robinsoniana*, *N. sanguinea*, *N.* 'Conqueror.'

Deep Crimson—*N. atropurpurea*.

Tender varieties:

Blue—*N. gigantea*, *N. stellata pulcherrima*, *N.* 'William Stone,' *N. Listeri* and *N. gigantea Hudsoniana*.

Crimson and pink, shades of—*N. devoniensis* (night flowering), *N. zanzibarensis rosea*, *N.* 'Mrs. C. W. Ward,' *N. stellata rosea*, *N.* 'Lord Brooke,' and *N.* 'Earl of Warwick.'

THE APHIDES ATTACKING CULTIVATED PEAS AND THE ALLIED SPECIES OF *MACROSIPHUM*.

By FRED V. THEOBALD, M.A., F.E.S., Professor of Economic Zoology in London University.

[Read before the Congress of Entomology at Oxford on August 7, 1912.]

THIS paper showed that three species of Aphides or Dolphin attack cultivated peas, namely *Macrosiphum pisi* Kaltenbach, *Megoura viciae* Kaltenbach, and *Aphis rumicis* Linnaeus.

The first-named is the most important, and is spoken of in Britain as the green dolphin of peas, in America as the destructive green pea louse. It was originally described by KALTENBACH as *Aphis pisi*, and was said by him to occur on a number of plants besides *Pisum* spp., such as *Spiraea Ulmaria*, *Geum urbanum*, *Lotus* spp., *Lathyrus* sp., *Trifolium* spp., *Spartium*, *Ononis*, and many others. This pea aphis, the *pisi* of Kaltenbach, has been sunk as a synonym of SCHRANK'S *Aphis ulmariae* by aphidologists. KOCH described the aphis on *Geum* as *Siphonophora gei*, and this has also been sunk as a synonym of *ulmariae*.

Mr. THEOBALD reinstated both KALTENBACH'S *pisi* and KOCH'S *gei*. The characters by which these different green *Macrosipha* can be identified were shown to be the structure of the cornicles and the arrangement of the sensoria on the antennae.

In *Siphonophora pisi* the cornicles are imbricated, whilst in *S. ulmariae* Schrank feeding on *Spiraea Ulmaria* and in *S. gei* Koch, which feeds on *Geum urbanum*, they are reticulated at the apex. These green *Macrosipha* can be divided into two groups—i., the *pisi* group, in which the cornicles are imbricated, and this group also contains two new species, one on *Lotus corniculatus*—*loti* Theobald, and another on the wild *Trifolium procumbens*—*trifolii* Theobald; ii. contains *ulmariae* Schrank, *gei* Koch, and *stellariae* Schrank, which have the apex of the cornicles reticulate. By noticing these characters we find that *M. pisi* only occurs on plants of the genus *Pisum*, *Lathyrus* (both wild and cultivated), and on all three varieties of clover (*Trifolium*). This narrows down very much the list of food-plants of this destructive species, and thus gives us more hope of being able to cope with it, an impossible thing to do if it occurred on the great variety of plants mentioned by previous writers. The life-cycle of *pisi* was shown to be as follows: The winter in Europe and the northern parts of America is passed in the egg stage on clovers, and to some extent on wild and cultivated *Lathyrus* (everlasting peas); in May and June winged females fly to the peas (*Pisum*), and there live until late summer, when they fly back to clovers and wild *Lathyri*, and also to cultivated ones; later they oviposit there.

Megoura viciae also winters on *Lathyrus sylvestris*, and flies in spring to the peas and beans.

The part played by birds such as sparrows, starlings, willow wrens, whitethroats, and tits in destroying these aphides was mentioned, and two cases quoted where they had completely cleared them out. With regard to treatment, it was stated that spraying with soft soap and quassia, or tobacco wash, easily killed the aphis on tall garden peas, but could not be applied in field peas. Nor could the American brush and cultivator method be used in England, as there is not sufficient space between the rows to allow this, owing to the luxuriant growth which covers most of the soil.

Cultural methods could probably be found which would enable us to check the migration between the clovers and the peas, and in conjunction with this the eradication wherever possible of the wild *Lathyri* in the hedgerows was advocated.

SWEET LAVENDER.

By Miss H. C. Philbrick, F.R.H.S.

The common Lavender, like the Rosemary, has long been grown in British gardens. It is a native of the South of Europe, the North of Africa, and the West of Asia, in warm, rocky, and barren places. It is particularly abundant in Provence, where—as the Rosemary, the Thyme, and the Heath do in other districts—it gives a peculiar flavour to the honey which is known as the Miel-de-Provence, and which, after that of Narbonne (a kind that takes the flavour of Rosemary), is considered the best in France.

We gather that the Lavender was held in high estimation by the Greeks and Romans for its fragrance and aromatic properties; and it is valued on the same account in Britain, as well as France, and has been largely cultivated in fields and gardens for its medicinal virtues from time immemorial.

Medicinal value.—In the form of tincture, spirit, or essential oil, it is considered a powerful stimulant to the nervous system, and is consequently generally had recourse to in headaches, faintness, and other affections. Lavender is a tonic, a restorative, carminative and warming. Some sixty years ago it found a place as lozenges in the British Pharmacopœia, but it is there no longer, though old-fashioned chemists still keep the lozenges.

Its Fragrance.—The odour resides entirely in the essential oil which is contained in every part of the plant, but principally in the flower-stalks, from which the oil is obtained by distillation, and when mixed with spirits of wine forms the well-known Lavender water of the perfumers. The flowers, on account of their powerful aromatic odour, are frequently put into wardrobes among clothes as a preventive against the attacks of moths, etc., more especially in the case of woollen stuffs. A few drops of the oil will serve the same purpose. So powerful are the effects of the oil, that if a single drop of it be put in a box with a living insect the latter dies almost immediately.

Cultivation of Lavender.—It is cultivated in various parts of France as well as in our own country; but England carries the palm for the best Lavender Water. The driest soil in the warmest situation produces the most oil. The Lavender has been long cultivated in the neighbourhood of London, and in many counties of England. Many years ago Park Place (near Henley-on-Thames) was celebrated for its Lavender plantations, which occupied between forty and fifty acres. There are big fields of it near Corfe Castle, new but flourishing. All the cultivation the plant requires after it is well-established in a field is to keep it free from weeds. The flowers are obliged to be sold to a regular licensed distiller, or to be distilled on the premises, on

account of the Excise laws. The Lavender generally carries blue flowers, though there is a white variety, and this was known many years ago, for in 1649, when the "Survey of Wymbledon Manor" was made, "there were in the Kitchen Gardens very great and large borders of Rosemary, Rue, and White Lavender."

Twenty-four species are described, of which only two are of general interest, namely, the common lavender (*Lavandula vera*), of which we have been treating, and *Lavandula Spica*. Both are natives of the sterile hills of the South of Europe and Barbary. The former yields the fragrant oil, the latter the "Oil of Spica," which is employed by painters on porcelain and in the preparation of varnishes for artists. It may be interesting to know that the County of Essex has grown a vast amount of Lavender within recent years. The late Mr. Orst, of Kelvedon, was a keen specialist in this direction, and his fields were, I think, unique. He grew Lavender largely for the London markets besides selling large quantities of it to passers-by on the highway; his fields were situated in the parish of Feering, and were to me a never-failing source of attraction and delight. The little bushy, grey-green plants in winter waiting for the call of spring, and oh! the joy of the harvest. The main road passed the fields, and at the gate was stationed a lad, a table covered with bunches of fresh-cut Lavender for sale, and a chair placed for the boy at the receipt of custom. The fields in the background were in full bloom, and memory revels in recalling both the sight and the perfume. Large quantities of Lavender were put on the Great Eastern Railway at Kelvedon, the Lavender train bearing it away to the great city, shedding its burden of sweetness on the summer air. It seems a pity that Lavender is not more largely cultivated in Essex and Suffolk.

Soil.—A light sandy soil is best, and, where so planted, the quality is far superior to that grown on rich soil. Plants in light sandy soil give a far greater strength of perfume, and bear the cold winters better than in rich garden soil. The plants are grown from cuttings, or slips, and sometimes from seed. The first year yields a good crop, the second the finest, and the third year the plants must be taken up and replaced.

The Various Uses of Lavender.—The late Duke of Wellington used (so the legend runs) to revel in a bottle of Lavender-water in his bath; and who would grudge the brave soldier-statesman this delicious luxury? Do we not all like it in homœopathic doses in our hand-basins on a hot day in summer? Parkinson gives us the following: That in his time the "heads of the flowers were much vsed to bee put among linen and apparell"—a custom handed down from mother to daughter in English homes for many a century after. This was in 1633, when Charles I. was king. Our great-grandmothers delighted in putting sprigs of Lavender among their napery and fine linen, and in many houses the custom continues to the present time. Lavender has been used considerably the last three or four years in table decorations—a new use for it, and the effect was very good when the colours

harmonized. Lavender was a rare plant in the "spacious times of Great Elizabeth." Its very name carries with it a sense of wholesomeness and the pure fragrance of Nature, and we cannot but rejoice that good taste and good gardening (which in cultural matters was never more to the forefront than now) have bidden us to restore what had been so neglected, though happily not lost, to its rightful place in our gardens.

Uses in the Garden.—There are so many ways in which Lavender may be used, sometimes as a low hedge to divide the well-filled ranks of the kitchen garden from the flowers planted on either side of a central pathway: sometimes grouped in the herbaceous border, to give the needful touch of silver-grey which serves to lighten the colours of bright-hued flowers, or it may be planted with excellent effect to lean over the top of a retaining wall. It will even bear clipping like box to make a formal edging (if it should be desired) in a garden design of purple and grey. A Lavender walk is perhaps the most delightful of all in June, when the soft spikes are beginning to push up from every branchlet and the light passing of a hand over the bushes stirs the faint scent of the young growth; in August, when the first early flowers are breaking with blue, and the time has come to cut the sheaf of spikes which will fill a house for many a day with the incense of their fuller perfume; or again, later on when the quiet grey of the leaves suits the mood of the sombre winter's day. Memory with many of us recalls such a Lavender walk backed by a hedge of China roses—a mingling which we shall find very hard to surpass in its delicate harmony. There are few months in the year, save in the dead of winter, when roses are not to be gathered there, but it is in the autumn, when flowers are few, that a plantation of this kind is most precious. It must be remembered that Lavender does not last in perfection, as I think I reminded you before, for ever. It must be cared for, or it will lose all too soon the soft swell of its kindly outline and grow twisted and gnarled and unsightly for lack of timely clipping. For this work there are two seasons: in the autumn if a harvest of flower spikes is looked for in August, but if merely the grey tone of leafage is wanted, the bushes must be cut back in spring before the young growth has had time to start. And now you may like to know what flowers look well in association for garden decoration. China roses I have already mentioned, and they are always happy in conjunction. Clarkia pink, both single and double, look well. All pink flowers and roses are good, the well-known rose 'Madame Testout' being one of the best.

Seeing that I hold a brief for Lavender, may I be pardoned if I tell you of an incident that happened at the Chester Assizes last March. It was headed "Lavender as a Vegetable," and it was decided by Lord Coleridge that it was one. The ruling arose during the hearing of a case in which a poor man had hawked Lavender without a licence. The defence was that the Pedlars' Act exempts vegetables, and therefore no

certificate was required; but prosecuting counsel declared that Lavender was not a vegetable, as the word was generally understood. His lordship said he did not see why the word vegetable should be limited to things nice to eat. Lavender was neither animal, nor mineral, nor fire, nor air, nor water, and that pretty well exhausted the natural kingdom.

DELPHINIUMS AT WISLEY, 1912.

One hundred and twenty-three stocks of Delphiniums were sent in for trial at Wisley in 1911. They were all planted out in ground that had been deeply dug and moderately manured, in rows 6 feet apart, and 4 feet apart in the rows. Owing to the plants being in some cases very small and weak, to their being received at so many different dates, and to the dry season of 1911, the trial was not completed in that year, but was continued in 1912. The result more than justified expectations. Nearly all the plants made a sturdy, healthy start, and grew so well that some plants attained a height of 10 feet, with correspondingly long flower-spikes. Mildew attacked some varieties, but this was checked by spraying the foliage with $\frac{1}{3}$ oz. sulphide of potassium dissolved in 1 gallon of water.

A.M. = Award of Merit.

1. A. F. W. Hayward (Kelway).—Height of plant 6½ feet, length of spike 24 inches; flowers semi-double, Venetian blue suffused with lilac-mauve and having a blackish-brown centre.

2. Albert Edward (Forbes), **A.M.** June 9, 1896.—Height of plant 5 feet, length of spike 25 inches; very free-flowering; flowers semi-double, outer petals deep marine blue, inner petals rich violet-purple; centre small and dark.

3. Amethyst (Forbes).—A strong grower, reaching 7 feet in height; length of flower-spike 30 inches; flowers very pretty, deep cornflower blue with white eye.

4. Bacon (Forbes).—Height 8½ feet, length of spike 36 inches. A very effective variety, carrying cobalt-blue flowers shaded with bright purple on a tapering spike; centre dark.

5. Bassanio (Bunyard). A very pretty single variety, reaching 7 feet in height; flowers marine blue tinged with deep violet, loosely arranged on a good spike 25 inches long; eye conspicuous, creamy-white.

6. Bass Rock (Forbes).—Height of plant 7 feet, length of spike 28 inches; flowers cornflower blue much tinged with violet-purple; eye white.

7. Beauty of Langport (Kelway), **A.M.** June 11, 1895.—Failed to start.

8. Belladonna superba (Hobbies).—A pretty variety, growing 5½ feet high and carrying numerous spikes of large single pale Venetian-blue flowers very lightly arranged. The spikes measure about 20 inches in length. The whitish centre has two conspicuous golden-yellow patches upon it.

9. Branching Persimmon (Kelway).—Height 6½ feet; flowers broad, Venetian blue with white centre, single, lightly arranged on spike 28 inches long. The foliage of this variety is much divided.

10. Cappadocia (Bunyard).—This variety did not grow very vigorously and only attained the height of 4 feet; the flower-spikes are short and carry semi-double flowers of a creamy-white colour.

11. Capri (Ruys).—A distinct variety, reaching 5½ feet in height and bearing on blunt spikes an abundance of long-spurred, light cornflower-blue, broad flowers, which stand out well from the main stem. The plant is of branching habit and the leaves are deeply divided. The spikes measure about 29 inches in length.

12. C. B. Fry (Forbes).—Height 6¼ feet; flowers cornflower blue tinged with bright violet-purple; spike tapering, 20 inches long; eye dark. A very pretty variety.

13. Christine Kelway (Kelway).—A very strong grower, reaching a height of 8¼ feet. The stock appeared to be mixed. One plant carried semi-double Venetian-blue flowers tinged with mauve, and the other, flowers of a much lighter blue, but with a greater proportion of mauve. Both plants were very free-flowering, and the spikes measured 30 inches in length.

14. Clipper (Forbes).—Height 6½ feet, carrying very effective 36-inch tapering spikes of cobalt-blue flowers with a prominent dark brown eye.

15. Colonel Crabbe (Forbes), **A.M.** June 18, 1912.—A very handsome and effective variety, growing to the height of 7½ feet. The spikes are tall, tapering, and well furnished, and measure 3 feet long. The flowers have the outer petals cornflower blue and the inner ones bright violet-purple, with practically no eye. The plant is very free-flowering.

16. Coriolanus (Bunyard).—Height about 4 feet; spikes short; flowers single, small, marine blue, often tinged with bright violet; centre white.

17. Countess of Ilchester (Kelway).—Height 8½ feet; spikes numerous, 2 feet long, well furnished; flowers roundish, semi-double, bright Venetian blue shaded with bright violet; centre white.

18. Crompton Roberts (Forbes).—Height 5¼ feet; spike blunt, well furnished, 27 inches long; flowers marine blue heavily tinged with bright violet-purple.

19. Cymbeline (Bunyard), **A.M.** June 18, 1912.—A strong, healthy grower, reaching 6 feet in height; spikes very numerous, 24 inches long; flowers semi-double, small, cornflower blue tinged with violet-mauve. A good showy variety.

20. Cyrus (Bunyard).—Height 5 feet; spikes numerous, 20 inches long; flowers loosely arranged, pale primrose-yellow with deeper centre, single.

21. Damona (Bunyard).—Height 4½ feet; spikes small, 19 inches long; flowers semi-double, creamy-white.

22. Daniel (Bunyard).—A very showy variety, growing 5 feet high; spikes numerous; flowers large, outer petals marine blue, inner ones bright violet-purple; centre whitish.

23. Darius (Bunyard), **A.M.** June 18, 1912.—Height 6 feet. A very healthy, strong grower, bearing semi-double creamy-white flowers

on spikes about 21 inches long. One of the best whites in the trial.

24. David Todd (Forbes).—Height 3 feet, length of spike 10 inches; flowers marine blue heavily tinged with dark purple; dark eye. A very pretty variety.

25. Dr. Bergman (Forbes), **A.M.** June 18, 1912.—Height 4½ feet; spike blunt, well furnished, 25 inches long; flowers large, cornflower blue tipped with bright violet-purple; eye small and dark. A very pretty variety.

26. Dr. Lodwidge (Kelway), **A.M.** June 18, 1912.—A very effective variety, growing to the height of 6½ feet. The flowers are lightly arranged on spikes 28 inches long and are semi-double and of large size. The outer petals are cobalt blue and the inner ones bright violet; eye white.

27. Dr. McWatt (Forbes).—Height 7½ feet. The small, dense spikes of this variety measure about 18 inches long, and the flowers are cornflower blue tinged with bright violet; centre white.

28. Dorothy Kelway (Forbes).—Height 5 feet; spike short and dense; flowers deep cornflower blue with a prominent dark eye.

29. Duke of Connaught (Forbes).—A pretty variety, growing 5½ feet high. The tapering spike measures about 20 inches in length, and carries cornflower-blue flowers tinged with bright violet-purple.

30. Dusky Monarch (Kelway), **A.M.** June 4, 1912.—A very handsome variety, throwing up a large number of excellent spikes to the height of 9 feet. The flowers are large, deep violet-purple in colour, shading to marine blue towards the margins of the petals; centre dark.

31. Eugene Sandow (Forbes).—Height 6½ feet; spike tapering, 30 inches long; flowers cobalt blue tinged with bright violet-purple; eye dark and prominent.

32. Evangeline (Forbes).—A very pretty variety, reaching the height of 5½ feet. The spikes, which average 17 inches in length, are well furnished with royal-blue flowers tinged with bright violet-purple; eye dark.

33. Evelyn Bell (Forbes).—A tall variety, attaining the height of 8½ feet. The spikes, which measure about 48 inches in length, are thin and but sparsely clothed. The flowers are cobalt blue heavily shaded with bright violet; prominent dark eye.

34. Florence (Forbes).—Height 6 feet; spike 36 inches long, tapering; flowers deep cornflower blue with a white eye. A very pretty variety.

35. Garth (Forbes).—Height 6 feet; spike tapering, 21 inches long; flowers deep cornflower blue slightly tinged with rich pansy-violet; dark eye.

36. Garibaldi (Forbes).—Height 8 feet; stock mixed. One plant carried cornflower-blue flowers tinged with violet-purple and having a white eye, while the flowers of the other were much more heavily shaded with violet-purple and had a dark brown eye. In each case the spikes were good.

37. General Roberts (Forbes).—Height 4½ feet; spike 15 inches long, densely crowded with creamy-white flowers having a yellowish eye.

38. General Ulrich (Forbes).—Height 7 feet; flowers remarkably small, semi-double, marine blue tinged with bright violet-purple; small inner petals white; flowers closely arranged on a spike measuring about 25 inches in length.

39. Helena (Bunyard).—Height 5 feet; spikes numerous but poor; flowers small, pale royal blue shaded with bright violet.

40. Hermann Steinger (Forbes).—Height 4¾ feet; spike 25 inches long; flowers very pretty, deep marine blue shaded with bright violet-purple; eye small, white.

41. Hermia (Bunyard).—Height 5½ feet; spikes of good shape and measuring 17 inches long; flowers single, cornflower blue, blackish-brown centre.

42. Holyrood (Forbes).—A good variety, growing 7½ feet high; spikes tapering, 2 feet long; flowers semi-double, small, cobalt blue slightly tinged with violet-purple; eye white.

43. Huish Beauty (Kelway).—A very striking variety, reaching the height of 8 feet; spikes good, measuring 32 inches long; flowers marine blue with violet-purple edge; whitish centre.

44. Hypatia (Bunyard).—Height 5¼ feet; very free-flowering habit; spikes 20 inches long; flowers large, closely arranged, light cornflower blue with lilac-mauve inner petals.

45. Imperial Mantle (Kelway).—Height 9 feet. A good variety, having large spikes measuring 34 inches long; flowers semi-double, large; outer petals marine blue, inner petals bright violet-purple.

46. In Remembrance (Forbes).—A very effective variety, reaching the height of 6 feet; spike 17 inches in length; flowers violet-purple with dark eye.

47. James W. Kelway (Kelway).—Height 7 feet; spikes 28 inches long, numerous; flowers very large, measuring 2½ inches across, semi-double, violet-purple, white eye. This variety blooms late and is most effective.

48. Jessica (Bunyard), **A.M.** June 18, 1912.—Height 8½ feet; spike 38 inches long; flowers semi-double, royal blue with a tinge of mauve; dark brown centre. A very free-flowering, healthy, and vigorous variety.

49. John Forbes (Forbes).—A very pretty variety, growing 6¾ feet high. It is very free-flowering, and has spikes 24 inches long, carrying pale cobalt-blue flowers which become tinged with bluish-violet; eye white.

50. J. S. Sargent (Forbes), **A.M.** June 18, 1912.—A very handsome and effective variety; height 8½ feet; spike 3 feet long, tapering, well furnished with pretty marine-blue flowers tinged with dark purple. A good late variety.

51. Kelway's Effective (Kelway).—A very free-flowering variety; height 8 feet; spike bold and effective, 33 inches long; flowers semi-

double, pale cornflower blue much tinged with violet-mauve; eye dark; stems hairy.

52. Kelway's Lovely (Kelway).—Height 7 feet; spikes numerous, well furnished, 29 inches long; flowers bright cornflower blue tinged with mauve. A very pretty variety.

53. Kelway's Magnificent (Kelway).—A very graceful variety, growing 7½ feet high and bearing numerous good 34-inch spikes of lightly arranged Venetian-blue flowers with a white eye.

54. Kelway's Remarkable (Kelway).—Height 6 feet; spike blunt, 22 inches long; flowers double, marine blue and deep violet-purple with whitish eye; too crowded in spike.

55. King George (Kelway).—Height 5½ feet; length of spike 19 inches; flowers very pretty, semi-double, large, marine blue with white eye.

56. King of Delphiniums (Kelway).—Height 7 feet; spike blunt, 27 inches long; flowers double, marine blue shaded with deep violet-purple; eye white.

57. Kitty Wardell (Kelway), **A.M.** July 8, 1902.—A very pretty double variety, reaching 4 feet in height, with good spikes, well furnished with well-placed, small, cornflower blue flowers slightly shaded with violet-mauve.

58. Knight of Langport (Kelway).—A good variety, 7 feet high, with spikes 33 inches long, bearing lightly arranged marine-blue flowers with a conspicuous white centre.

59. Lady Fair (Kelway).—Height 6¼ feet; spikes 27 inches long, numerous; flowers large, not crowded; centre creamy-white, outer petals pale Venetian blue, inner petals lilac-mauve. A very effective variety, of free-flowering habit.

60. Lemberg (Kelway).—A vigorous variety, growing 8 feet high, and having well-furnished tapering spikes, measuring 34 inches in length; flowers large, marine blue tinged with violet-mauve. This was the earliest-flowering Delphinium in the trial.

61. Lizzie Van Veen (Box), **A.M.** June 18, 1912.—A lovely variety—one of the best in the trial. Height 6½ feet; spikes 35 inches long; flowers large, single, cornflower blue, with small white eye.

62. Lorenzo (Bunyard), **A.M.** June 18, 1912.—A very healthy, vigorous variety, growing 8 feet high. Spikes 28 inches long; flowers single, marine blue slightly tinged with deep violet-mauve, lightly arranged; deep brown centre covered with yellow hairs.

63. Lord Hawke (Forbes).—Height 8½ feet; spike 3 feet long, tapering; flowers deep marine blue becoming tinged with violet-purple; eye white. A very free-flowering variety.

64. Lord Holland (Forbes).—Height 7 feet, spike 30 inches long; flowers cobalt blue with dark eye; one of the earliest to flower.

65. Lord Kitchener (Forbes).—Height 6½ feet, spike tapering, 24 inches long; flowers pale ultramarine blue shaded with violet-purple; eye white.

66. Lord Rothschild (Forbes).—Height $5\frac{3}{4}$ feet, spike 25 inches in length; flowers rich blue with white eye.

67. Mabel (Nash).—Height $6\frac{3}{4}$ feet; spike 25 inches long, tapering; flowers single, ultramarine blue with prominent white centre; outside of petals and spur hairy.

68. Macbeth (Bunyard).—Height $6\frac{1}{2}$ feet; spikes nicely shaped, 20 inches long; flowers semi-double, cornflower blue deeply tinged with violet-mauve.

69. Madame E. Geny (Forbes), **A.M.** June 18, 1912.—A very distinct variety growing $8\frac{1}{2}$ feet high. The spikes are tapering, 40 inches long, and very effective. The flowers are of a good violet purple colour shaded with deep cornflower blue; eye small and white; stems reddish.

70. Margorie (Nash).—Height $6\frac{1}{4}$ feet; spike tapering, 30 inches long; flowers deep cornflower blue with dark-brown centre.

71. Mary Morrison (Forbes).—A very free-flowering variety growing 9 feet high. The average spike measures 24 inches long, but numerous side-spikes are produced, thus prolonging the season of flowering considerably; flowers cornflower blue, tinged with bright-violet; eye white.

72. Medea (Bunyard).—Height $7\frac{1}{2}$ feet; spikes 25 inches long, numerous; flowers very pretty, outer petals marine blue, inner petals bright violet-purple.

73. Mevrouw de Kat (Ruys).—Failed to start.

74. Miranda (Bunyard).—Height $5\frac{1}{2}$ feet; spikes numerous, small and short; flowers violet-mauve with outer petals mostly cobalt blue.

75. Miss McLennan (Forbes).—A very effective Delphinium of moderate height; flowers cornflower blue with bright violet shading and a prominent white eye; stem and outside of flowers hairy.

76. Moerheimii (Ruys), **A.M.** June 22, 1909.—Height 6 feet, spikes about 30 inches long; flowers large, pure white with white eye; numerous branches arise from the base of the central spike. They are of a most convenient size for cutting and well furnished with flowers.

77. Monarch (Forbes), **A.M.** June 25, 1903.—Height 9 feet, spikes 28 inches long; flowers pale cobalt blue much tinged with bright violet, which increases in intensity with the age of the flower; a very free-flowering variety with a white eye.

78. Mr. J. S. Brunton (Ruys), **A.M.** June 18, 1912.—An excellent deep cornflower blue variety having large flowers which stand out well from the main stem; it has a white eye covered with deep orange hairs and grows six feet high. The individual spikes measure 20 inches long. The foliage is deeply divided.

79. Mrs. Cartwright (Box).—Too poor to describe.

80. Mrs. James Kelway (Kelway), **A.M.** June 18, 1912.—A very beautiful variety, 8 feet tall. The spikes are blunt and measure 33 inches long; the flowers are semi-double, pale Venetian blue with white eye.

81. Mrs. John Michie (Forbes).—Height, 6 feet; spike 24 inches long, tapering; flowers deep cornflower blue with white eye.

82. Mrs. Thomson (Ruys).—A deep marine blue variety, shaded with deep violet-purple, having large flowers which stand out well from the main stem and have a prominent dark brown eye. Height, 5 feet; length of spike, 21 inches.

83. Mrs. Toms (Forbes).—Height 7 feet; spike 26 inches long, tapering. The stock of this variety appeared to be mixed, one plant having flowers of cornflower blue tinged with pale bluish-violet and a dark eye, while the other had cobalt blue flowers with a white eye.

84. Mrs. Tree (Forbes).—Height 8½ feet; spike tall, tapering, 33 inches long; flowers cobalt blue shaded with light bluish violet; dark eye.

85. Nansen (Forbes).—Height 6½ feet; spike 18 inches long, compact; flowers small, cornflower blue, often heavily tinged with bright violet; white eye.

86. Navy Blue (Charlton).—Height 7½ feet; spike tapering, 42 inches in length; flowers marine blue shaded with violet-purple and having a white centre.

87. Nerissa (Bunyard).—Height 5½ feet; spike good, 20 inches long; flowers semi-double, pale cornflower blue with a trace of mauve at the base of the petals.

88. Nineveh (Bunyard).—An excellent free-flowering, late variety growing 7½ feet high; spike 18 inches long, tapering; flowers semi-double, Venetian blue with a very conspicuous dark eye.

89. Norah Green (Forbes).—Height 5½ feet; spike blunt, 18 inches long; flowers closely packed, deep cornflower blue with a slight tinge of violet; white eye.

90. Norman Hirst (Kelway), **A.M.** June 28, 1904.—A beautiful semi-double variety, having the inner petals violet-purple and the outer ones marine blue. It has a white eye, is very free-flowering, and grows 6 feet high, with spikes 21 inches in length. One of the earliest to flower in the trial.

91. Nymph (Kelway).—A very pretty variety, growing 5½ feet high. Spikes numerous, 21 inches long; flowers royal blue with the inner petals violet-mauve, semi-double, with white eye.

92. Olivia (Forbes).—Height 7 feet; spikes tapering, 30 inches long; flowers cobalt blue, tinged with bluish-violet; white eye. A very pretty variety.

93. Opal (Kelway).—An excellent variety, growing 7½ feet high. Spike 18 inches long; flowers pale Venetian blue, with a creamy-white centre; late flowering.

94. Ophelia (Bunyard).—Height 5½ feet; spike good; flowers double, Venetian blue, shaded with lilac mauve. A late-flowering variety.

95. Orchioides (Bunyard).—Height 6 feet; spike 28 inches long; flowers semi-double, creamy-white, with a prominent dark-brown centre.

96. Persia (Bunyard).—A very handsome variety, growing 8 feet

high. Spikes 28 inches long; flowers double, loosely arranged, marine blue, with small white eye. Very free-flowering.

97. Persimmon (Forbes, Kelway).—Height 6½ feet; spike 25 inches long; flowers large, royal blue, slightly tinged with violet-mauve, white eye; leaves deeply divided. A very effective free-flowering variety.

98. Phyllis (Nash).—A very pretty, effective, marine blue variety, with a dark eye. It grows 6¼ feet high, and has spikes measuring 24 inches long.

99. Portia (Bunyard).—Height 7 feet; spike 25 inches long; flowers semi-double, bright royal blue, often tinged with violet-mauve; eye white. The outer petals and the spur are covered with downy hairs.

100. Progenitor (Forbes).—Height 8¼ feet; spike 41 inches long, tapering; flowers marine blue, heavily tinged with bright violet-purple; eye dark.

101. Purple Velvet (Kelway), **A.M.** June 21, 1910.—Failed to start.

102. Queen of the Delphiniums (Charlton).—A good, rather late-flowering variety, growing 8 feet high. The splendid tapering spikes measure 2½ feet long, and are well furnished with cornflower blue flowers of good shape, shaded with bright violet, and having a small white eye.

103. Ragged Robin (Forbes).—Height 3 feet, of branching habit; flowers cornflower blue, with violet-purple shading and a white eye.

104. Rev. J. Stubbs (Forbes).—A very pretty, free-flowering, pale royal blue variety, with a dark eye. Height 5 feet; length of spike 17 inches.

105. Rev. W. Wilks (Forbes), **A.M.** June 25, 1903.—Failed to start.

106. Rock Sand (Forbes).—Height 7 feet; spike 35 inches long, tapering, thinly furnished with very pale royal blue flowers having a dark eye.

107. Rosalind (Bunyard).—Height 5½ feet; spikes numerous, 17 inches long; flowers loosely arranged, single, small, royal blue with small white eye; outside of petals and spur hairy.

108. Royal Standard (Forbes), **A.M.** June 18, 1912.—Height 4½ feet; spike good, blunt, well furnished, with marine blue flowers having a white centre. Although of no great height, this proved to be one of the prettiest and most effective varieties in the trial.

109. R. P. Ker (Forbes).—A very handsome free-flowering variety, reaching to a height of 9 feet. The spikes are tapering, and measure 33 inches long. Flowers bright cornflower blue, heavily tinged with violet-purple; eye dark.

110. Salland (Ruys).—Height 6 feet; spike 25 inches long; flowers wide, deep marine blue, slightly tinged with violet-purple; eye brownish, covered with yellow hairs, very prominent. A very effective variety, with reddish stems.

111. Semi-double White (Adams).—Height 4¼ feet; spike 13 inches long; flowers creamy-white with yellowish eye.

112. Shylock (Bunyard).—Height 7½ feet; spikes numerous, 28 inches long, slender; flowers single, marine blue with white eye.

113. Sir George McCrae (Forbes).—Height 5½ feet; spikes 29 inches long; flowers cornflower blue tinged with bright violet and having a white centre. It is of free-flowering and branching habit.

114. Smoke of War (Kelway), **A.M.** June 18, 1912.—A very striking and distinct variety, growing 7 feet high. The spikes, measuring 33 inches long, are tapering and well furnished with symmetrical, large, deep violet-purple flowers.

115. Saponaria (Box).—Height 7 feet; spike 28 inches long, tapering; flowers marine blue shaded with dark purple; eye white.

116. Star of Langport (Kelway).—A very handsome variety, growing 6 feet high, with long spikes of single cobalt blue flowers having a white centre.

117. Telegram (Forbes).—Height 5½ feet; spike 18 inches long; flowers of medium size, dark blue, double.

118. Thomas H. Cook (Forbes).—A most effective variety, growing 6¾ feet high. The spikes measure 26 inches long, and are furnished with royal blue flowers having the lower petal violet-purple. The eye is dark and prominent and covered with yellow hairs.

119. Titania (Bunyard).—Height 4 feet; spikes 20 inches long; flowers small, fully double, lightly arranged, light cornflower blue much tinged with lilac mauve. Numerous small central petals are dark coloured. A very pretty variety.

120. Tour Eiffel (Forbes).—Height 7 feet; spike 25 inches long; flowers closely packed on spike, deep marine blue tinged with bright violet-purple, semi-double, with dark eye.

121. True Blue (Kelway).—Height, 5 feet; spike 27 inches long, good; flowers cornflower blue with dark eye. A very useful variety.

122. Ustace (Box).—Height 7 feet; spike 24 inches long; flowers cobalt blue. The inner petals are bright violet-purple.

123. Zuster Lugten (Ruys).—A very effective free-flowering variety, growing 5½ feet high. Spike 18 inches long, well furnished with deep marine blue flowers which are heavily tinged with violet-purple, and have a small dark eye.

SWEET PEAS AT WISLEY, 1912.

Seventy-nine stocks of Sweet Peas were received for trial at various times during February, March, and April of 1912. The majority were sown in the middle of March, in rows very thinly, averaging about six inches apart between the seeds. The land had been well manured and deeply dug for a previous crop. The germination was excellent, and considering how late they were sown, the growth was very good, most of the stocks attaining a height of seven feet. The stocks were mostly true, healthy, and flowered profusely. No mulch of manure in any form was applied, but the Dutch hoe was frequently used between the rows, thus keeping the soil below moist by preventing evaporation.

A.M. = Award of Merit.

Afterglow (Dobbie).—A very distinct variety. Standard, deep mauve, wings bright bluish-violet. Borne mostly in fours. A strong and vigorous grower.

Apple Blossom Spencer (Dobbie).—Described vol. xxxvii., p. 394.

Arthur Green (Dobbie).—Described vol. xxxvii., p. 394.

Asta Ohn (Dobbie).—Described vol. xxxvii., p. 394.

Beauty of Fife (Stark).—A very useful deep rose-pink variety of large size. The plants are strong and very vigorous, and carry an abundance of fours.

Blue Jacket (Stark).—A pretty variety, having a white ground marbled with dark blue. It is very free-flowering, and a strong grower.

Charles Foster (Dobbie).—A charming flower, having the standards rosy-pink and the wings lilac. A strong grower.

Colleen (Dobbie), **A.M.** July 6, 1909.—Described vol. xxxvii., p. 394.

Countess Spencer (Dobbie).—Described vol xxxvii., p. 394.

Dobbie's Cream (Dobbie).—A good cream flower with prettily waved standard. It is a free-flowering variety, producing many fours.

Dobbie's Mid-Blue (Dobbie), **A.M.** June 23, 1908.—Described vol. xxxvii., p. 394.

Dobbie's Sunproof Crimson (Dobbie), **A.M.** June 21, 1910.—Described vol. xxxvii., p. 394.

Dorothy Eckford (Dobbie), **A.M.** September 2, 1902.—A splendid white Sweet Pea of vigorous growth, and very useful for cutting. An exceptionally free-flowering variety.

Double Maggie Stark (Stark).—Standards generally double, orange-salmon; wings, rose Neyron red. A very pretty variety.

Double Primrose Beauty (Stark).—A pretty cream-yellow variety, often with double standards.

Duplex (Dobbie).—A strong-growing, rosy-pink variety, mostly with double standards.

Earl Spencer (Dobbie), **A.M.** July 19, 1910.—Produces an abundance of fours. Described vol. xxxvii., p. 395.

Edrom Beauty (Dobbie).—A fine orange-salmon variety, producing an abundance of bloom.

Elfrida Pearson (Dobbie), **A.M.** July 19, 1910.—Described vol. xxxvii., p. 395.

Elsie Herbert (Dobbie), **A.M.** July 9, 1907.—The flowers are large, white edged with deep rose. A very pretty variety.

Etta Dyke (Dobbie).—Described vol. xxxvii., p. 395.

Evelyn Hemus (Dobbie). **A.M.** June 25, 1907.—Described vol. xxxvii., p. 395.

Fair Maid Improved (Stark).—The flowers of this charming variety are of palest rosy-pink prettily streaked with mauve-rose.

Florence Wright (Stark).—A good white variety of vigorous habit.

Florence Wright Spencer (Stark).—A good white variety of vigorous habit, bearing many fours.

Giant Lavender (Stark).—A pretty lavender variety of large size. It is very vigorous and free-flowering in habit.

Helen Pierce (Dobbie), **A.M.** July 14, 1911.—Described vol. xxxvii., p. 395.

Helen Williams (Stark).—A pretty flower, having a cream ground suffused with rosy-pink. Stock very mixed; requires more selection.

Hercules (Stark), **A.M.** July 26, 1912.—A large, rose-pink variety, having the base of the standard white. It is very free-flowering in habit, and useful for cutting.

Improved George Stark (Stark).—A very showy, bright scarlet variety of good size and shape.

Isobel Malcolm (Dobbie), **A.M.** July 26, 1912.—Described vol. xxxvii., p. 395.

Ivanhoe (Dobbie), **A.M.** June 21, 1910.—Described vol. xxxvii., p. 395.

John Ridd (Stark).—A fine dark variety, having the standard deep maroon and the wings vinous mauve.

King Manoel (Stark).—A very fine, large, dark maroon variety, producing an abundance of fours. A good, strong grower.

Lady G. Hamilton (Dobbie), **A.M.** July 14, 1896.—Described vol. xxxvii., p. 396.

Lady Knox (Dobbie), **A.M.** July 4, 1911.—A very vigorous grower. Most of the sprays carry four exceptionally large flowers having a ground colour of cream beautifully edged with buff on the standard.

Loyalty (Stark).—A variety very similar to 'Bluejacket.'

Majestic (Stark).—A free-flowering cream variety of vigorous habit.

Marchioness of Tweeddale (Dobbie).—A pretty, white-ground variety, having the waved standard and the wings suffused with rose-pink. Useful for cutting.

Marie Corelli (Dobbie), **A.M.** July 14, 1911.—Described vol. xxxvii., p. 396.

Marion Cuthbertson (Dobbie), **A.M.** July 19, 1910.—A pretty, pale lilac variety. Not such a vigorous grower as some.

Masterpiece (Dobbie), **A.M.** July 6, 1909.—Described vol. xxxvii., p. 396.

Mauve Queen (Dobbie).—A very pretty, bright lavender-mauve variety of good form.

May Campbell (Dobbie), **A.M.** June 4, 1912.—The flowers have a cream ground, and the central portion of the standard is marbled with carmine. The wings are slightly veined with the same colour.

Melba (Dobbie), **A.M.** May 22, 1912.—A magnificent pale salmon flower of excellent form and large size.

Mrs. A. Ireland (Dobbie).—Described vol. xxxvii., p. 396.

Mrs. B. Gilbert (Gilbert).—Flowers large, white edged with cream. The middle of the standard is marbled with magenta, and the wings are also veined with the same colour.

Mrs. Charles Taylor (Taylor).—A strong-growing, delicate rose-pink variety. It is very free-flowering in habit, and produces many fours.

Mrs. Collier (Dobbie).—Described vol. xxxvii., p. 396.

Mrs. Cuthbertson (Dobbie), **A.M.** May 22, 1912.—Standard, bright rose-pink; wings very pale rose, almost white; stems strong, mostly carrying four large flowers.

Mrs. Heslington (Dobbie).—A pretty lavender-mauve flower with waved standard. Not so vigorous in habit as some varieties.

Mrs. Hugh Dickson (Dobbie), **A.M.** July 6, 1909.—Described vol. xxxvii., p. 396.

Mrs. Routzahn (Dobbie), **A.M.** July 26, 1912.—A charming flower, combining shades of pink and faint apricot. It is very free-flowering in habit. A strong and vigorous grower, carrying many fours.

Mrs. W. J. Unwin (Dobbie).—A very pretty variety. The flowers have a white ground flaked with orange-scarlet.

Nora Unwin (Dobbie).—Described vol. xxxvii., p. 397.

Nubian (Dobbie), **A.M.** July 14, 1911.—Described vol. xxxvii., p. 397.

Pearl Gray (Dobbie).—A pretty, lilac mauve variety of good size. Plants strong and vigorous in habit.

Premier (Stark).—A fine, deep scarlet variety which well withstands the effects of hot sunshine.

Primrose Beauty (Stark).—A good grower of free-flowering habit, with large pale Naples yellow flowers.

Princess Victoria (Dobbie), **A.M.** July 9, 1907.—Described vol. xxxvii., p. 397.

Princess Victoria Improved (Stark).—A strong grower, having pretty, blush-pink flowers. A vigorous variety. Stock requires a little more selection.

Queen of Spain Spencer (Dobbie), **A.M.** July 14, 1911.—Described vol. xxxvii., p. 397.

Red Star (Dobbie).—A good, dark red variety. The colour unfortunately suffers in hot, sunny weather.

Rosabelle (Dobbie).—A very fine Sweet Pea of vigorous habit, bearing an abundance of pretty rose flowers somewhat similar to those of 'Marie Corelli,' but paler in colour.

R. W. Pitt (Stark).—A vigorous grower, bearing very pretty flowers of rose Neyron red colour.

Senator Spencer (Dobbie).—Described vol. xxxvii., p. 397.

St. George (Dobbie), **A.M.** July 9, 1907.—A bright, orange-scarlet flower of great decorative value. Exceptionally free-flowering in habit, and a vigorous grower.

Stirling Stent (Dobbie), **A.M** . June 22, 1909.—A wonderful, deep salmon variety of great beauty.

Tennant Spencer (Dobbie), **A.M.** July 26, 1912.—A splendid purplish-mauve variety, having large flowers and a very robust habit. It is exceptionally free in flowering, and carries plenty of fours.

The King (Dobbie), **A.M.** June 23, 1908.—A magnificent dark crimson Spencer variety of large size and excellent form.

Thomas Stevenson (Dobbie), **A.M.** June 4, 1912.—A very vigorous and healthy grower. Flowers large, bright orange-scarlet.

White Queen (Stark).—A good, pure white, with prettily waved standard. It has slightly larger flowers than 'Etta Dyke,' and is of very vigorous habit.

No. 1 (King).—A very pretty, rose-pink variety, a little paler than 'Beauty of Fife.' A strong grower, carrying plenty of fours.

No. 2 (King).—A pretty, very pale pink variety of large size and very vigorous habit. Flowers produced mostly in fours.

No. 3 (King).—The standards of this variety are maroon, and the wings plum-violet.

No. 4 (King).—A pretty, rose-pink variety, inclined to pale orange at the margin of the standard.

No. 5 (King).—A distinct variety of a violet-rose colour.

No. 6 (King).—A pretty flower, having the waved standard violet-rose and the wings lilac-mauve.

No. 20 (Stark).—A fine, deep carmine variety of good shape and size.

The varieties remaining longest in flower were (in order) 'Mrs. Routzahn,' 'Dobbie's Sunproof Crimson,' 'Majestic,' 'Asta Ohn,' 'Pearl Gray,' 'Blue Jacket,' 'Countess Spencer,' 'Dobbie's Mid-Blue,' 'Dorothy Eckford,' 'Isobel Malcolm,' 'King Manoel,' 'Lady Knox,' 'Mrs. Hugh Dickson,' 'Premier,' 'Senator Spencer.'

VIOLAS AT WISLEY, 1912.

Two hundred and twenty-five stocks and one hundred and seventy-six varieties were received for trial. They came in very irregularly in February, March, April, and May. They were planted in a semi-shaded position in fairly good soil that had been dug about one foot deep. All the stocks made capital growth and flowered freely, making beautiful masses of colour. Although this plant will grow on almost any soil, in sun or shade, the finest results are always obtained from vigorous young plants in soil that has been generously manured, and if they are not permitted to form seed-pods they will continue blossoming all through the summer and autumn.

A.M. = Award of Merit.
XXX = Highly Commended.

1. Accushla (Dickson, Forbes).—A strong, compact grower, suitable for bedding, having large foliage. It is very free flowering, and has medium-sized flowers of very pale sulphury-white, beautifully rayed with violet-purple and having the upper petal faintly tinged with bluish-violet.

2. Admiral of the Blues (Dobbie, Forbes).—A vigorous, spreading, free-flowering variety, with medium foliage and large, violet-purple, rayless flowers.

3. Agnes Kay (Cuthbertson, Dickson).—A good, free-flowering, bedding variety of spreading habit, with large foliage, and big flowers having the lower and side petals white edged with pale violet-blue, while the upper petal is almost wholly violet-blue. Faintly rayed.

4. Ajax (Dickson).—A very strong-growing and free-flowering variety, having large flowers of palest greenish-white suffused with pale heliotrope. A very pretty rayless Viola.

5. A. J. Rowberry (Dickson), **A.M.** June 25, 1895.—A strong, spreading grower, with medium foliage, and rayless flowers of pale lemon-yellow. This was not considered by the Committee to be a true stock of the variety.

6. Alpha and Omega (MacPhail).—A strong, compact grower, with medium foliage, and flowers of pale magenta with whitish middle and violet-purple rays. It was selected from a batch of seedlings, and on account of the fact that it flowers over a very long period was given this distinctive name.

7. Arabella (Forbes).—An excellent, vigorous and compact bedder of very free-flowering habit, with medium foliage, and large rayed flowers of rich purplish plum-violet.

8. Archie Grant (Cuthbertson, Dickson, Dobbie, Forbes), **A.M.** July 11, 1899.—A vigorous and compact grower, excellent for bedding and very free-flowering. Flowers large, deep rich purple.

9. Ariel (Forbes).—A strong, spreading variety, with small foliage. and medium lavender-blue flowers with a sulphury-white middle. Rayed and free-flowering.

10. Bessie (Dickson), **A.M.** July 26, 1912.—A good, compact bedder, with medium foliage, and very pretty white, rayless flowers tinged with pale purplish-mauve. A very free-flowering variety.

11. Blanche (Forbes).—A good bedding variety, with large greenish-white rayless flowers. Foliage large; habit good and compact.

12. Blue Bell (Forbes).—A pretty, very free-flowering variety of vigorous spreading habit. Foliage medium; flowers small, rayed, deep violet.

13. Blue Bird (Evans).—An exceptionally vigorous, spreading variety, with large foliage, and very pretty small flowers having the upper petal dark purple margined with a lighter shade, and the other petals bluish-violet. Rayed with violet-purple; very free-flowering.

14. Blue Bonnet (Forbes).—One of the miniature section, with small, rayed, pale violet-blue flowers, borne in great profusion.

15. Blue Cloud (Dickson, Dobbie, Forbes).—A strong, spreading variety, with large foliage, and big sulphury-white flowers edged with pale blue. Rays dark blue.

16. Blue Duchess (Dobbie).—A very free-flowering, pale violet variety, of strong, spreading habit. Foliage medium; flowers large, rayed.

17. Blue Gown (Dickson, Forbes), **A.M.** July 5, 1897.—A free-flowering, spreading variety, with medium flowers of pale violet-blue, having a lighter middle. Rayless.

18. Blue King (Forbes).—A compact grower, with small foliage, and very small flowers of lavender-blue with deep violet-purple blotch around the centre; rayed.

19. Blue Rock (Dobbie).—A strong, compact grower, suitable for bedding, having large foliage, and good-sized violet-purple flowers shading to a light blue in the middle. It is a free-flowering variety.

20. Blue Stone (Dickson).—This very free-blooming variety is of exceptionally compact habit and has large foliage. The flowers are rather small, rayed, and deep violet-purple in colour.

21. Bradley's Seedling No. 8 (Bradley).—A strong, spreading grower, with medium-sized, narrow foliage. Flowers rayed, large, rich dark purple, with crinkled margins. A good bedding variety.

22. Bradley's Seedling, No. 17 (Bradley).—A very vigorous, tall variety, with large foliage, and big flowers of dark velvety purple with a darker middle and very smooth edges. It is very free in flowering.

23. Bradley's Seedling (Bradley).—A strong, dwarf variety of spreading habit, similar in colour to Seedling No. 17, but having a much broader flower; rayed.

24. Bridal Morn (Dickson).—A large, bluish-violet-purple variety of strong, spreading growth, with medium foliage.

25. Bridegroom (Forbes).—This variety is of strong, spreading habit, and very free-flowering. The foliage and flowers are

both small, and the colour is bright bluish-violet, which unfortunately fades quickly.

26. Bronze Kintore (Cuthbertson, Forbes).—A large, dark bronze and purple flower, very distinct; a poor grower, of spreading habit, with medium foliage.

27. Bullion (Dickson, Dobbie), **XXX** July 5, 1898.—A very vigorous, strong, spreading variety, of free-flowering habit, suitable for bedding. Flowers medium, deep golden yellow, rayed.

28. Bute Yellow (Forbes).—A good, rayless variety, of vigorous, spreading habit, with medium foliage and flowers. Colour a lovely clear canary-yellow.

29. Campbell Bannerman (Forbes).—The flowers of this pretty rayless variety are light violet-purple and of medium size. The plant is a strong, spreading grower, and has large foliage and a free-flowering habit.

30. C. B. Murray (Cuthbertson).—This variety is of spreading habit, with large foliage, and medium flowers of dark, velvety purple mottled with lighter shades.

31. Cecilia (Forbes).—A strong, compact grower, with medium foliage, and pretty white flowers having a deep and irregular edging of pale violet; rayed with blue; very distinct and free-flowering.

32. Charles Jordan (Dobbie).—A compact grower, with medium foliage and flowers. Colour violet-purple, shading lighter towards the middle of the flower; lower petal slightly rayed.

33. Charles Traill (Forbes).—A vigorous grower, of compact habit, suitable for bedding, and very free-flowering. Foliage large; flowers medium, pale violet, faintly rayed; the bottom petal curls up.

34. Charlotte Chambers (Forbes).—A small, sulphury-white, rayless variety, of strong, spreading habit, with medium foliage.

35. Christiana (Dobbie), **XXX** July 4, 1893.—This is a strong, spreading variety, with medium foliage, and rayless flowers of pale sulphury-white having a chrome-yellow blotch on the lower petal. It is very free-flowering in habit.

36. Colonel Plumer (Dickson).—A very free-flowering, strong, spreading variety, with large foliage, and medium flowers. It is a good bedder, and the colour is sulphury-white edged and tinged with ageratum-blue, especially on the upper petals; rayed.

37. *cornuta* (Dickson).—A charming, dwarf, tufted species, very suitable for the rockery. The flowers are smaller than those of the bedding Viola, and are violet-purple in colour. The leaves are cordate-ovate, crenate and ciliated. Very free-flowering.

38. Councillor Watters (Dickson, Dobbie, Forbes), **A.M.** July 18, 1905.—A strong, compact grower, with medium foliage, and large rich, dark purple flowers. A very free-flowering variety, and one of the best for bedding.

39. Countess of Hopetoun (Dobbie), **XXX** August 16, 1898.—A good, large, rayless white, of vigorous, compact habit, with large foliage.

40. Countess of Kintore (Dobbie, Forbes).—This is a free-flowering, deep violet variety, with a very broad, white edging. The flowers are small, and the plant is vigorous and spreading in habit.

41. Crieffie Smith (Cuthbertson).—A strong, spreading grower, of free-flowering habit, with large foliage and medium flowers of deep violet, having the upper petals lavender.

42. Crimson Bedder (Dobbie).—A strong grower, of spreading habit, with medium foliage. Flowers large, borne in great profusion, deep reddish-purple; very effective.

43. Cynthia (Forbes).—This is a very handsome, deep violet-purple, rayed variety of large size. The foliage is large, and the habit of the plant is strong and spreading.

44. Darkey (Dickson).—A most distinct variety, velvety black in colour, shading to deepest violet-purple in the middle. Flowers and foliage medium. Habit strong and spreading.

45. Dawn (Evans).—A very pretty, free-flowering, rayless variety, of exceptionally strong, spreading habit, having large sulphury-white flowers with a slight tinge of ageratum-blue on the upper petals.

46. Dobbie's White Bedder (Dobbie).—This is one of the best pure white bedding varieties yet introduced. It is a strong, healthy grower, with large foliage, and flowers which are produced abundantly.

47. Duchess of Fife (Forbes), **XXX** August 2, 1892.—A very strong, spreading grower, with large foliage. The flowers are large, bright chrome-yellow, prettily and irregularly edged with bluish-violet and rayed with deep brown. A very free-flowering variety.

48. Duchess of Sutherland (Forbes).—A useful bedder, of strong growth and very free-flowering habit. Flowers small, pale violet, rayed.

49. Duchess of York (Dobbie).—A good variety, of vigorous, spreading habit, with medium foliage, and having large, greenish-white flowers rayed with purple.

50. Edina (Dobbie), **A.M.** July 26, 1912.—A very strong, compact grower, producing large foliage and a great abundance of very large, deep violet-purple flowers having darker blotches on the lower and side petals. A good bedding variety, stronger in growth and better in colour than 'Archie Grant.'

51. Edward Molyneux (Forbes).—A vigorous, spreading variety, with medium foliage and flowers. Colour sulphury-white with a slight tinge of ageratum blue; rayless.

52. Elie (Forbes).—A free-flowering, strong, spreading variety, with medium flowers of sulphury-white much mottled with violet-blue and rayed with deep violet-purple. Foliage medium size.

53. Eminence (Forbes).—An excellent bedder, of large size and of a rich, dark purple colour. Habit vigorous, spreading, and free-flowering; foliage large.

54. Florizel (Dobbie, Forbes).—This is a lovely lilac-mauve bedding variety, of strong, spreading, and exceptionally free-flowering habit. The rayless flowers and the foliage are both of medium size.

55. Fred Williams (Forbes).—A compact grower, with medium foliage. Flowers medium, pale violet-purple, with prettily crinkled margins.

56. G. C. Murray (Cuthbertson, Forbes).—A spreading variety, with medium foliage, and large, deep, velvety purple, almost black, flowers, having the upper petals shading to violet-blue.

57. George Palmer (Forbes).—A good, compact grower, having small, deep, golden yellow, rayless flowers.

58. Gertie (Forbes).—A very pretty variety of vigorous, spreading habit, with large foliage. The flowers are very large, pale primrose-yellow, rayed with purple, and edged with bright violet-purple, which is suffused over the upper petals.

59. Glow (Dickson).—A strong, compact grower, with medium foliage and small, vinous-mauve, rayed flowers.

60. Grieveïr (Dobbie).—A good bedding variety, of strong, spreading habit, with medium foliage, and small, yellow flowers, rayed. It is very free-flowering.

61. Hector McDonald (Dickson, Dobbie).—A splendid bedding Viola, of strong, compact habit, with large foliage. Flowers very large and abundantly produced; ground amber-white with violet-purple rays; upper petals almost wholly violet-purple, and the others irregularly edged with the same.

62. Holyrood (Forbes).—A strong, spreading variety, of free-flowering habit, with medium foliage. Flowers medium, deep violet-purple, having very dark chestnut-brown marks on lower petals.

63. Ithuriel (Dobbie).—A very vigorous, spreading variety, with medium foliage. Flowers violet-purple, shading to blue in the middle, lightly rayed, medium-sized, borne in great profusion.

64. Ivanhoe (Forbes).—This is a good bedding variety, of spreading habit and strong growth. It is very free-flowering, and has large foliage and rayed flowers of rich dark purple.

65. James Erskine (Dickson).—A strong, compact grower, with large foliage, and flowers of dark bronze-purple, marbled with lighter shades.

66. James Pilling (Forbes).—A strong, compact variety, with medium, rayless, milk-white flowers prettily edged with pale violet.

67. James Sim (Cuthbertson).—A prettily rayed, medium-sized, deep lemon-yellow variety, of strong, spreading habit, with large foliage.

68. Janet Thomson (Cuthbertson).—This is a good, rich, pansy-violet bedding variety, of medium size, and of strong, spreading habit, The flowers are rayless. The foliage is large and the plants are very free-flowering.

69. J. B. Riding (Cuthbertson, Forbes), **A.M.** July 11, 1899.—A charming, dark sport from 'William Neil.' It is very free-flowering, vigorous, and spreading in habit. Flowers medium, purplish-mauve, rayed.

70. Jean Craik (Dickson).—A pretty, rayed, pale sulphury-white

flower edged with light ageratum-blue. It is strong and spreading in growth and free flowering in habit.

71. Jenny Houston (Dickson).—A very vigorous grower, spreading in habit, with large foliage, and dark purple flowers of good size, shading almost to pure mauve in the upper petals; rayed.

72. John Currie (Cuthbertson).—A spreading variety, with medium foliage and flowers. Colour pale sulphur-yellow, often tinged on the edges of the petals with slaty-blue; faintly rayed.

73. John Ferrier (Forbes).—This is a small, lavender-blue variety, with a blotch of chrome-yellow on the lower petal. The foliage is medium in size and the habit of the plant spreading; rayed.

74. John Forbes (Forbes).—A strong, compact grower, of very free-flowering habit, suitable for bedding purposes. The flowers are medium, rayed, dark purple.

75. John Quarton (Dickson, Forbes), **A.M.** July 26, 1912.—This variety has a splendid constitution, is of good habit, and covers the ground well. The flowers are of good size and pale violet-mauve in colour. An excellent variety for bedding.

76. Jubilee (Cuthbertson, Dobbie), **A.M.** July 26, 1912.—A strong grower, covers the ground well, and throws up its rich, dark purple, rayless flowers in greater profusion than 'Councillor Watters.' An excellent bedder.

77. Kate Blyth (Cuthbertson, Dickson).—A vigorous, spreading variety, with large foliage. Flowers numerous, large, pale sulphury-white, tinged at the edges with pale purplish-mauve; rayless.

78. Kate Cochrane (Cuthbertson, Dickson).—A very strong and vigorous grower, of spreading habit, with very large foliage. Flowers large, dark purple, shading off lighter towards the margins of the upper petals; rayed.

79. Kingcup (Dickson, Dobbie, Forbes), **A.M.** July 26, 1912.—A most useful, very free-flowering variety, with medium, rayless flowers of bright golden yellow. It is of vigorous, spreading habit, with large foliage.

80. Kitty Bell (Cuthbertson, Dobbie, Forbes).—A very pretty, pale heliotrope variety, of vigorous, free-flowering habit. It covers the ground well and has large foliage.

81. Klondyke (Dobbie).—A deep golden yellow variety, rayed. Habit strong and spreading; free-flowering; foliage and flowers medium.

82. Lady Grant (Forbes).—A strong, compact grower, with medium foliage. Flowers medium, sulphury-white, prettily edged with violet-purple; rayless. A good bedder and very free flowering.

83. Lady Newlands (Cuthbertson).—A rich pansy-violet variety, very similar to 'William Hunter.' The plant is spreading and free-flowering, and has large foliage.

84. Lady of the Snows (Forbes).—A compact grower, with medium foliage. Flowers freely produced, medium, white, rayless.

85. Lark (Cuthbertson, Dickson).—This is a good, free-flowering

bedder, of vigorous, spreading habit, with large foliage. The flowers are large, very pale sulphury-white, edged with pale ageratum-blue; rayed.

86. Lavender Queen (Cuthbertson), **A.M.** July 26, 1912.—A splendid bedding variety, of strong, spreading habit, with medium foliage and large, rayed, pretty, pale purplish-mauve flowers.

87. Lilacina (Dobbie).—A strong, spreading grower, of free-flowering habit, with medium foliage. Flowers medium, very pale violet-purple, with a reddish-brown blotch on lower petal; rayed.

88. Lilian (Forbes).—A strong-growing variety, bearing an abundance of medium-sized flowers, which have the lower petal rich chestnut-brown and the side ones rich pansy-violet, while the upper petals are almost pale lilac in colour; rayed.

89. Lizzie Paul (Cuthbertson, Dickson).—A good, deep golden yellow, rayed flower, of medium size. The plant is compact and a strong grower, especially useful for bedding, and has medium foliage.

90. Lyric (Forbes).—A very free-flowering variety, of the miniature section, with very pretty, light violet-purple flowers fading to pale heliotrope; faintly rayed.

91. Mable (Dickson).—A strong, spreading grower, with medium foliage. Flowers medium, sulphury-white, with an edge of pale bluish-violet, which is also suffused through the upper petals; rayed. A good bedder.

92. Maggie Clunas (Dobbie).—A good, compact variety, with large, pale primrose-yellow flowers, slightly rayed.

93. Maggie Currie (Dickson).—A strong, compact-growing bedding variety, with large foliage, and a very free-flowering habit. Flowers medium, pale purplish-mauve.

94. Maggie Mott (Cuthbertson, Dickson, Dobbie), **A.M.** July 26, 1912.—This is undoubtedly the best variety of its colour. It is a vigorous, spreading grower of exceptionally free-flowering habit, and has medium foliage. The flowers are large, pale bluish-violet in colour, which gets lighter towards the middle of the flower.

95. Maid of Lorn (Dickson).—A strong, spreading grower, with medium foliage. Flowers medium, rayed, pale vinous mauve. It is a very free-flowering variety, but much resembles 'J. B. Riding' and 'William Neil.'

96. Marchioness (Dobbie), **A.M.** July 27, 1898.—A good, very free-flowering bedder, of sturdy and compact habit. Flowers medium, white with a very faint tinge of amber-white on the lower petal; rayless.

97. Marginata (Forbes).—A very pretty miniature variety, of strong constitution and exceptionally free-flowering habit. Flowers amber-white deepening to chrome-yellow, the lower petal edged with ageratum-blue.

98. Mary Burnie (Cuthbertson, Dickson, Forbes).—A strong, spreading variety, with medium foliage. Flowers very large, pale sulphur-yellow edged with violet; rayless.

99. Mauve Queen (Dobbie).—A good, strong, compact grower, suitable for bedding. The foliage is large, and the flowers are of good size and pale violet-mauve in colour. Very free-flowering.

100. Max Kolb (Forbes).—A very old variety, of strong, spreading growth, having medium-sized, rayed flowers of deep violet-purple. A free bloomer.

101. Miss Chrissie Paton (Cuthbertson).—A spreading variety, with large foliage. Flowers large, light violet-purple, becoming brighter towards the edges of the upper petals and lighter towards the middle of the flower; rayed. A free bloomer.

102. Miss D. Brown (Cuthbertson).—A strong, spreading, and free-flowering variety, with large flowers of rich velvety purple, with lighter streaks on the upper petals.

103. Miss Finlay (Cuthbertson).—A rather shy-flowering variety, of strong growth, with medium foliage. Colour bright purple, becoming lighter at the margins and in the upper petals.

104. Miss Michie (Forbes).—This is a pale violet, rayless variety, of small size and spreading habit.

105. Molly Pope (Dickson).—A good, spreading variety, of free-flowering habit. Flowers medium, deep golden yellow; very pretty.

106. Moseley Perfection (Cuthbertson), **A.M.** May 9, 1911.—An excellent, large, deep golden yellow, rayless Viola, of strong, spreading habit. It has large foliage and is most useful for bedding purposes.

107. Moseley Purple (Cuthbertson).—A strong grower, spreading, with large foliage. Flowers very large, rich deep violet-purple, with darker lower petal. A very fine variety.

108. Mrs. Allsop (Forbes).—A very pretty bedding variety, with medium, light violet-purple flowers, slightly rayed. It is a strong and healthy grower.

109. Mrs. C. B. Douglas (Dickson, Dobbie).—This is a strong, compact bedder, of nice habit, with small foliage. The flowers are medium, and are produced in great profusion. Colour very bright golden yellow; rayed.

110. Mrs. C. F. Gordon (Forbes).—A compact grower. Foliage medium; flowers medium, with deep purple centre, the upper petals and edges of lower petals shading to lavender.

111. Mrs. Chichester (Cuthbertson, Dickson, Dobbie, Forbes), **A.M.** July 26, 1912.—An excellent bedding variety, of strong, compact habit. Flowers large, pale sulphury-white edged with violet-blue; rayed. A very free bloomer and one of the best varieties.

112. Mrs. C. Turner (Dobbie), **XXX** July 4, 1893.—A very strong, compact grower, with large foliage. Flowers medium, dark violet-purple, rayed. Very free-flowering.

113. Mrs. Davidson (Forbes), **A.M.** July 26, 1912.—A very striking and distinct Viola, of vigorous, spreading habit, with large foliage. It is exceptionally free-flowering, and a good bedder. The flowers are large, lobelia-blue, rayed with dark blue.

114. Mrs. Geo. Charles (Cuthbertson).—A strong, spreading grower, with medium foliage. Flowers very freely produced, white, deeply flaked with bluish-violet.

115. Mrs. Geo. Paterson (Dickson).—A very vigorous grower, with large leaves and a spreading habit. Flowers large, sulphur-white edged with pale bluish-violet and rayed with deep blue.

116. Mrs. Gloag (Forbes).—A very pretty, faintly rayed, violet-purple variety, of medium size. Foliage small; habit spreading.

117. Mrs. H. Kinross (Cuthbertson).—A very distinct, deep velvety bluish-purple Viola having lighter upper petals. The habit is spreading and the foliage medium.

118. Mrs. J. Girdwood (Cuthbertson).—This variety resembles 'Lady Newlands,' but is somewhat lighter. Habit spreading; foliage medium; flowers, large, rich pansy-violet. A very free bloomer.

119. Mrs. J. Gray (Cuthbertson).—A weak grower, with medium foliage and flowers. Colour pale sulphur-yellow edged with pale violet-blue; rayed faintly.

120. Mrs. J. Kinnear (Forbes).—A small, rayless, pale violet-blue variety, of compact habit, with medium foliage.

121. Mrs. Marrison (Marrison).—This variety was sent in as a cross between 'J. C. Erskine' and 'David Simpson.' It is an exceptionally strong and vigorous grower, of compact habit, producing large fine flowers and foliage. Colour deep velvety purple mottled with lighter shades and having traces of crimson, dark mahogany, and bronze.

122. Mrs. McGraire (Dickson).—A good, compact grower, with medium foliage. Flowers medium, very light vinous mauve; rayed.

123. Mrs. Norris-Elye (Dobbie).—A charming, light lilac-mauve variety of large size; rayless. It is strong and spreading in habit, with medium foliage, and is a very free bloomer. It is one of the newer varieties, and is better than 'Florizel,' though somewhat similar in colour.

124. Mrs. Pat (Forbes).—A vigorous, compact bedder, of very free-flowering habit, with medium leaves and flowers. Colour light bluish-violet.

125. Mrs. R. Ellis (Cuthbertson).—Habit spreading; flowers and foliage medium; colour dark purple shaded into almost white in parts of the lower and side petals; upper petals nearly all white, with a pale violet tinge.

126. Mrs. Scott Elliot (Forbes).—A very vigorous, spreading variety, with large foliage. Flowers large, pure white, rayless. A faint tinge of pale ageratum-blue was noticeable on some of the flowers. A very free bloomer.

127. Mrs. T. W. R. Johnston (Dickson).—A strong, spreading grower, with large leaves. Flowers large, deep velvety purple shading to violet-blue in the upper petals and at the margins. Rayed and very free-flowering.

128. Mrs. W. Sydenham (Dickson).—A good, deep golden yellow,

rayless variety, of medium size. Habit strong and spreading; foliage large.

129. Nellie (Cuthbertson, Dickson).—A useful, creamy-white, rayless bedder, of strong, compact habit. Flowers and foliage medium. A free bloomer.

130. Nellie Chapman (Cuthbertson).—Habit spreading; foliage medium; flowers large, very pale sulphury-white edged with bluish-violet; rayless.

131. Nelly M. Brown (Forbes).—A very free-flowering variety, of the miniature section, with small, deep golden yellow, rayless flowers. Habit spreading.

132. Ophelia (Cuthbertson, Dobbie).—A charming, deep rose-mauve variety, suitable for bedding. Habit compact; a strong grower; rayed; flowers large.

133. Palmer's White (Palmer), **A.M.** July 26, 1912.—This is a splendid dwarf variety, of fine constitution and compact habit. It is the result of a cross between 'Seagull' and a dwarf white seedling. The rayless flowers are pure white, large, and very freely produced.

134. P. A. Smith (Dickson).—A strong and vigorous grower, of compact habit, with medium foliage. Flowers small, pale primrose-yellow mottled with violet-blue and rayed with steel-blue.

135. Pembroke (Dickson, Forbes).—A deep primrose-yellow, rayless variety, of strong growth and compact habit. Foliage medium, long, and narrow; flowers medium, borne in great profusion.

136. Pencaitland (Dobbie), **A.M.** July 11, 1899.—A vigorous, spreading variety, with medium foliage. The flowers are medium, very pale amber-white, lower petals shaded with chrome-yellow and slightly rayed. A very free bloomer. The Committee, at their visit to the trial, wished to confirm the award made to this Viola in 1899.

137. Perdita (Forbes).—Habit spreading; foliage medium; flowers medium; colour pale violet-blue with amber-white middle; rayless.

138. Polly (Forbes).—A strong, compact grower, with very large leaves and large sulphury-white flowers edged with light bluish-violet and rayed with dark blue. A free bloomer.

139. Primrose (Forbes).—A deep primrose-yellow, rayless bedder, of large size and very vigorous, spreading habit. A free-flowering variety.

140. Princess May (Forbes).—One of the miniature section, having very pretty white, rayless flowers. It is a compact grower and useful for bedding.

141. Progress (Forbes).—A very vigorous, spreading variety, with large foliage. Flowers medium, pale violet-purple shading lighter towards the middle; faintly rayed.

142. Purity (Dobbie, Forbes).—A very free-flowering, large, rayless, white variety, of great value for bedding. Habit spreading; growth strong.

143. Queen of the Year (Dickson, Forbes).—Another of the minia-

ture section, having very pretty, light bluish-violet flowers with sulphury-white middle. Very free-flowering and compact in habit.

144. Redbraes White (Dobbie).—A useful bedder, of large size and very pale greenish-white in colour. Very free-flowering, compact, and strong in growth.

145. Redbraes Yellow (Dobbie).—A strong grower, compact, and free-flowering in habit. Flowers deep golden yellow, rayless. Useful for bedding.

146. Robert Hastie (Cuthbertson).—Habit very vigorous, spreading; foliage large; flowers large, rayed, amber-white deepening to cadmium-yellow on lower petal and shaded with faint bluish-violet on upper petals.

147. Robert M. Grier (Cuthbertson).—A weak grower, with medium, deep purple flowers having the upper petals lighter.

148. Robert Neil (Cuthbertson).—Habit spreading; a very vigorous grower with large foliage; flowers large, dark purple, much mottled with other shades; rayed. A free bloomer.

149. Rolph (Forbes).—A very free-flowering bedding variety, of medium size and pale blue colour prettily rayed with dark blue. It has medium foliage; vigorous in growth and compact in habit.

150. Rotherfield Belle (Yates).—This is a sport from 'Kitty Bell,' having medium violet flowers faintly rayed. It is a strong grower and very free-flowering.

151. Royal Blue (Bath).—A very effective bedder, of spreading habit and vigorous growth. Flowers medium, deep violet-purple, rayed.

152. Royal Scott (Dickson, Dobbie).—A strong, compact grower, of free-flowering habit, suitable for bedding. Flowers medium, deep violet-purple.

153. Royal Sovereign (Dickson, Dobbie, Forbes, Stark), **A.M.** July 18, 1905.—A very strong, spreading grower, with medium foliage, and large golden yellow, rayless flowers. It is very free-flowering, and undoubtedly the best of its colour.

154. Shamrock (Forbes).—A large sulphury-white, rayless variety, edged with ageratum-blue. Habit compact; growth strong; foliage medium. A good bedder and free bloomer.

155. Sir Robert Pullar (Forbes).—A spreading variety, with medium foliage, and rayed flowers of violet-purple becoming more blue in the middle.

156. Snowflake (Cuthbertson, Dobbie, Forbes), **A.M.** July 26, 1912.—An excellent rayless, white bedder, of exceptionally free-flowering habit. A strong and healthy grower.

157. Snowline (Evans).—A good, very pale greenish-white bedding variety, of compact habit and strong growth.

158. Sylvia (Dobbie).—A sulphury-white, rayless variety, of large size. Habit spreading; growth vigorous; foliage large.

159. The Mearns (Forbes), **XXX** August 5, 1891.—This is a very

old variety, of spreading habit. The flowers are medium, dark purple, with upper petals lavender.

160. Thomas Bell (Forbes).—A strong, compact grower, with large foliage and big amber-white flowers faintly tinged at the margin with ageratum-blue; rayless. Useful for bedding and very free-flowering.

161. True Blue (Dobbie).—This is probably the oldest variety in the collection, having been in cultivation for forty years. A strong, spreading grower, with medium foliage. Flowers medium, deep blue with darker rays. Very free-flowering.

162. Violetta (Forbes).—Another variety of the miniature section, having very fragrant white flowers tinged with chrome-yellow; rayless. A very free bloomer.

163. Virgin White (Dickson, Dobbie).—A strong grower, of spreading habit, with medium flowers of sulphury-white edged with ageratum-blue; rayless. Flower-stalks long.

164. Walter Welsh (Dobbie), **A.M.** July 26, 1912.—A vigorous, tall-growing variety, of very free-blooming habit. Flowers medium, deep golden yellow, heavily rayed. Foliage medium.

165. Waverley (Dobbie).—A strong, compact grower, with large foliage and rayless, creamy white flowers edged with pale bluish-violet. A very free bloomer.

166. White Beauty (Dickson).—Habit compact; growth strong; foliage and flowers small. Colour pale greenish-white; rayless.

167. White Duchess (Dobbie).—A strong grower, of very free-blooming habit. Flowers medium, amber-white with margins irregularly tinged with violet-blue; lower petal blotched chrome-yellow; rayed. Good bedder.

168. White Empress (Dobbie).—A vigorous, spreading variety, with pale greenish-white, large flowers; rayless. A good bedder.

169. W. H. Woodgate (Forbes), **A.M.** July 26, 1912.—A strong, spreading variety, with medium foliage and pale lavender-blue flowers shaded sulphur-yellow in the middle; rayed. Very distinct, free-flowering, and useful for bedding.

170. William Daniels (Forbes).—A good variety, with large, deep, velvety violet-purple flowers. Habit spreading; growth vigorous; foliage large.

171. William Hamilton (Forbes).—A fine, dark, rosy-purple, of large size, with good foliage. A vigorous grower, of compact and free-flowering habit.

172. William Hunter (Cuthbertson).—A vigorous, spreading variety, with large foliage. Flowers rich pansy-violet mottled with lighter shades; rayed. A free bloomer.

173. William Neil (Dobbie, Forbes), **A.M.** July 5, 1897.—An exceptionally free-flowering, pure mauve, slightly rayed variety. Habit spreading; foliage medium; growth very strong.

174. William Robb (Forbes).—A very pretty bedder, of strong growing, spreading habit. Foliage large; flowers light violet; rayed.

175. Willie Farmer (Cuthbertson).—Flowers large, sulphury-white edged with faint blue; rayed; habit spreading and free-flowering; foliage large.

176. Woodcock (Cuthbertson).—A weak grower, with medium foliage, and flowers of sulphury-white edged with lavender-blue; rayless.

BOOK REVIEWS.

"The English Flower Garden and Home Grounds." By W. Robinson. Ed. 11. 8vo., 976 pp. (Murray, London, 1911.) 15*s.* net.

It is surely unnecessary to write a lengthy review of this reprint. Its appearance proves its widely known fame—especially when one realizes that the fifth, sixth, and tenth editions were also reprinted once, and the eighth no less than four times. Can there be anyone in England who owns a trowel and a square yard of garden ground who does not know it? Yet the pleasant memories its well-known illustrations call up in my mind bid me linger awhile over it. Many of them are still to me the type and embodiment of my ideas of certain plants whose aspects I first learnt from seeing them therein. The handy form in which it is arranged, the first part replete with information for the designing and forming of almost every possible style of garden, the second with its alphabetical list of plants suitable for the open-air, makes it still the best book I know of for English gardeners, until they arrive at a sufficient knowledge of its contents to warrant their buying a more costly and complete work. Nicholson's Dictionary of Gardening should then be sought, but the constant re-reading of "The English Flower Garden" will still be useful, especially to assist in planning and maintaining beautiful garden effects.

"The Complete Gardener." By H. H. Thomas. 8vo., 579 pp. (Cassell, London, 1912.) 10*s.* 6*d.* net.

The aim of this book is stated in the preface thus: "It is concerned in bringing to notice the list of hardy flowers, greenhouse flowers, evergreen and blossoming shrubs, fruits and vegetables, and in telling how they are grown," and farther on a plea is urged for the "light vein" of its style, the object of which claims to be "to present prosaic facts in a readable fashion."

Some 579 pages are devoted to this laudable effort. In these days, when there is scarcely a living soul outside prisons, hospitals, and lunatic asylums who does not garden in some form or other, there may be a sufficiency to read, mark, and learn from such a book. Rather less of the sprightly, somewhat forced, lightness of vein would have left more room for facts, prosaic or otherwise, and surely the gardener who aims at completeness must require all the facts available.

Thus, to say of *Solidago Virgaurea* "the yellow flowers that come only at the top of the stem are not very showy" may be the truth, but the whole truth should include *S. Shortii*, whose arching panicles make such a brave show, in a book that is to bring to notice the *best* of hardy flowers.

There are rather too many of such openings as "What shall one

say?"; "It seems scarcely necessary that I should say much"; "How futile it seems to attempt"; "There is perhaps little to say," &c. These may represent the light vein apologized for in the preface—but are not very amusing.

Still, it is ever easy to find fault, so we will content ourselves with grumbling at the total omission of the lovely and easily grown autumnal crocuses, also at the reason given for deep planting for crocuses—viz., because the new *bulb* (which is a *corm*, by the way) forms on the top of the old one. This shows a shocking lack of *complete* knowledge, for the stand-roots of a crocus are fully capable of pulling it several inches deeper in the ground in a year or two. Then again *Aquilegia alpina*, in spite of its fancy portraits, has no white about it, and is such a poor flimsy thing, even when it condescends to flower at all, in ordinary English gardens, that we cannot agree it is "suitable for the rockery."

There is, however, a great deal of information in these many pages, and the illustrations are good and numerous. No one reading carefully therein could fail to profit from them and improve his knowledge of gardening, but I hope, even should he read all of them, he will not claim the title of a complete gardener for himself.

"Wild Flowers as they Grow." By G. C. Nuttall, B.Sc. Photographed by H. E. Cooke, F.R.P.S. 2nd and 3rd Series. 8vo., 7 + 197 pp., viii + 199 pp. (Cassell, London, 1911.) 5*s*. net each.

A series of popular notes written round coloured illustrations of familiar wild plants reproduced from colour photographs of the plants *in situ*. The value of colour photographs should be that the colour tones are nearer nature than can be got by means of ordinary "three-colour" reproductions, but all that can be said of these is that, while they are as good as most of their class, they do not represent exactly the delicate tints of many of our wild plants. Reference to the plate of the beautiful little wood-sorrel opposite p. 116 will show what we mean, for it is represented with a lavender tint. Those in the 3rd series are much more pleasing. The reds are too red, the blues often too blue, and so on. The book will prove useful, though, in enabling the novice to acquaint himself with the names of some common plants, and to read something about them.

"Types of British Vegetation." Edited by A. G. Tansley, M.A., F.L.S. 8vo., xx + 416 pp. (University Press, Cambridge, 1911.) 6*s*. net.

This is the first serious attempt to describe the flora of the British Isles according to habitat and distribution in relation to environment. Much piecemeal investigation has been carried on, and its results are here brought together. Such investigations as these, together with research in vegetable physiology and the enormous bulk of experience gained in gardens, will by and by give an opportunity for a book on the principles of horticulture which will be worthy the

name, and compare favourably with Lindley's "Theory of Horticulture," written when knowledge was comparatively little—a book that will be something more than most of the gardening books of the present-day series of recipes for the cultivation of particular plants, comparable only with recipes for cooking.

The distribution of any particular plant depends, of course, not only upon the suitability of its inanimate environment, but upon the opportunities it has of colonizing the particular area, and upon its powers of resisting encroachments of other plants. Sometimes, we fear, ecologists are not sufficiently alive to the last two factors, but are apt to lay too much stress upon the nature of the soil or climate. This seems particularly the case with certain maritime plants. *Armeria maritima* grows well in gardens, but rarely wild away from the sea. *Glaucium luteum*, the yellow horned poppy, is the same. The fact of the matter seems to be that plants grow wild where they can, not where they can grow best and most luxuriantly.

We find, perhaps, few theories concerning plant distribution here, but rather a collection of observations. The state of our knowledge permits of little more than this at present. Ecology is not only a new term, as some would have us believe, but a term for a scientific approach to what has heretofore been more a desultory mode of examining a flora. The work of the field naturalists, the systematists, and morphologists; the work of botanical geographers, the students of vegetable physiology, and the students of plant anatomy; to say nothing of those who have studied the physical and chemical properties of the soil, have all prepared the way for it, and the work of all may be laid under contribution, and the outcome of the new point of view now called ecology will be a sure foundation for the building of principles of plant growth.

This book will serve as a good guide as to what has already been done in the British Isles, and will show what awaits the doing. But we doubt whether ecology is a subject for the dilettante to take up—it has its "interesting" side—but to further our knowledge deep study of plants is necessary beforehand, and it is doubtful whether the young student will be able to do much with profit until he has read and studied much of the principles of botanical science, and grown capable of taking a wide view of the whole matter.

"Recent Progress in the Study of Variation, Heredity, and Evolution." By R. H. Lock. Third Edition. 8vo., xiv + 334 pp. (Murray, London, 1911.) 5*s*. net.

We have favourably reviewed the earlier editions of this admirable book, and it will suffice to say that the present one retains the excellencies of the others, and brings up to date the important subject-matter of which the book treats.

"The Highlands of South-West Surrey." By E. C. Matthews. 8vo., viii + 128 pp. 7 maps. (Black, London, 1911.) 5*s*. net.

This is a "Geographical Study in Sand and Clay," as its second title has it, and will be found very interesting to those who take more

aesthetic delight in "scenery," and inspiring to the student of geography.

Perhaps the most interesting chapter to the gardener will be that on the vegetation of the sand and clay (chapter iii., pp. 52-97). The photographs are well reproduced, but a little more care might have been spent on editing, and we should like to enter a protest against the use of such "common" names as 'Upright Moenchia,' 'Dwarf Silky Willow,' 'Narrow-leaved Prickly-toothed Shield Fern,' 'Awned Nit Grass,' 'Starved Wood Sedge,' 'Plantain Shoreweed,' 'Ciliated Pearlwort,' and so on.

"Wonders of Plant Life." By S. L. Bastin. 8vo., x + 136 pp. (Cassell, London, 1911.) 3*s*. 6*d*. net.

In this popular and well-illustrated book some of the more interesting phases of plant-life are interestingly written of. It contains little that cannot be found elsewhere, but the "young person" interested in natural history will find instruction mostly reliable.

As in most books of the kind there are some rather inexact statements. We read of the mistletoe, for example, "In the winter the white berries are largely eaten by birds, and a certain number of the seeds will be likely to adhere to their beaks. To get rid of the encumbrance the bird cleans his bill by rubbing it backwards and forwards on the bark of a branch. . . . As the seed germinates . . ." As a matter of fact the berries are not ripe until winter is past, and seed so sown at Christmas, say, would fail to germinate. On a later page it is suggested that *Elodea canadensis* was rapidly distributed over Great Britain by means of seeds, but only the female plant is known in this country.

"The Process of the Year." By H. H. Brown, F.L.S. 8vo., x + 180 pp. (S.P.C.K., London, 1911.) 2*s*. 6*d*. net.

Another of the now numerous books of nature-study, dealing with the animals and plants which are most noticeable in the succeeding seasons of the year.

"Wild Flowers and their Wonderful Ways." By Rev. C. A. Hall. 8vo., x + 88 pp. (Black, London, 1911.) 1*s*. 6*d*. net.

Some good illustrations, including coloured plates more true to nature than many in such low-priced books, illuminate the text. The latter contains nothing new, but is interestingly written.

"Applied Biology." By M. A. and A. N. Bigelow. 8vo., ix + 583 pp. (Macmillan, New York, 1911.) 6*s*. net.

Apart from the rather greater amount of space given to physiology, and some few notes on economic uses of animals and plants discussed, this does not differ radically from other biological text-books. As an elementary text-book of biology it seems to be excellent; as a book of applied biology it scarcely covers the ground indicated by the title.

"Introduction to Science." By Prof. J. A. Thomson.

"Evolution." By Prof. J. A. Thomson and Prof. P. Geddes. Each 32mo., 256 pp. (Williams & Norgate, London, 1911.) 1*s.* net each.

These are eminently readable essays forming two volumes of the "Home University Library of Modern Knowledge." The general editor, Prof. J. A. Thomson, is a well-known writer on evolution and kindred subjects, and is known as well for his lucid exposition and scholarly English as for his wide knowledge and deep understanding. They are books which everyone, no matter what his line of thought may be, might read with profit and no little pleasure.

"Cacao: A Manual on the Cultivation and Curing of Cacao." By J. Hinchley Hart, F.L.S., late Superintendent of the Royal Botanic Gardens, Trinidad. 8vo., 307 pp., with numerous illustrations. (Duckworth, London, 1911.) 7*s.* 6*d.* net.

The late Superintendent of the Trinidad Royal Botanic Gardens was an authority on the subject of cacao cultivation and curing, and it is with much regret that we find it necessary to state that he was removed by death before his valuable book issued from the press. Having a practical knowledge of every detail connected with cacao, from the selection of suitable land for a plantation to the curing of the "beans" for export, and also an acquaintance with the trees in their native habitat, Hart was eminently qualified for the task he undertook, and in discharging it he has acquitted himself well.

The book opens with a discussion of the botany and nomenclature of the species of Theobroma, to which genus the cacao-tree belongs. Some nine species are known to botanists, but of these only *Theobroma Cacao* and *T. pentagona* appear to be of commercial importance. To the Mexicans *Theobroma Cacao* is known by the name of "Cacao-quahuitl," which to a large extent is retained in the word "chocolate."

The selection of land for a cacao plantation is an important matter, and the subject is dealt with in this book in a practical manner. Hitherto cacao-trees have been invariably propagated by seed, and as a consequence scarcely two plantations or even two trees produce "beans" of the same kind. To remedy this the author advocates a system of grafting whereby desirable kinds may be increased to any extent and the type fixed. The "approach" system of grafting has proved successful, and this method of propagation will probably gain favour in the future, and a more uniform kind of "bean" will be marketed.

In discussing the vexed question of shade for cacao the author confesses to a change in opinion on the subject, and admits the necessity of shade for cacao-trees, which he considers should be sufficient but neither too dense nor too light. With regard to manuring, the mulch-system is recommended owing to the surface-rooting habit of the tree, but the author is careful to point out that only trees in poor soil or

those bearing heavy crops of fruit should be treated, or more harm than good may be done. The English fruit-grower will be interested to learn, from the chapter on pruning, of a general belief prevailing in Trinidad that the moon influences the flow of sap in the cacao-tree, and that the time for pruning is regulated accordingly.

The diseases and pests to which cacao is liable are many. No less than eighteen kinds of fungus diseases are described in a special chapter on the fauna of the cacao-field; thirty-four animal and insect pests are enumerated, including man, whose damage is said to be "very considerable."

The processes of harvesting, fermenting, and drying cacao receive full treatment in the succeeding chapters, following which is a full account of the chemistry of cacao, written for the most part by Professor J. B. Harrison, C.M.G., Director of Science and Agriculture, British Guiana. The illustrations are; generally speaking, reproductions of photographs, and deserve more than a passing notice, as they appear to have been very carefully selected for elucidating the subject-matter and not merely to make the book attractive.

To those seeking information on the subject of cacao, or to anyone contemplating engaging in the cacao-planting industry, this book may be safely recommended, and it will probably remain the authoritative work on the subject for some time to come.

"Fleurs des Champs et des Bois, des Haies et des Murs." By H. Correvon. 8vo., 225 pp. 100 coloured plates by S. Rivier. (Albert Kündig, Geneva, 1911.) 25 fr.

This is a companion volume to the "Flore Alpine" of the same author, and although, as declared in the title, the plants dealt with are the commoner plants of Switzerland, many of them mere weeds from some points of view (*e.g. Lamium purpureum*, *Tussilago Farfara*, Dandelion, ground ivy, and *Ranunculus bulbosus*), yet the author describes them, and frequently their near relations too, in such a charming mixture of poetic fancies and wide knowledge, botanical, medical, bibliographical, etymological, or legendary, that even the commonest weed becomes full of interest. The coloured plates are singularly beautiful, and possess far more finish than those of the earlier book, which, although delightful in their outlines, are so lacking in shading that they remind one rather of designs for wall-papers than of the living plants.

In this new book it is hard where all are so excellent to single out any for praise, but a glance at Pl. 10, on which are shown catkins of Hazel and Sallow in two oblong panels of blue-grey, will convince anyone of the skill of the artist. The accuracy of drawing yet absence of hard outline, and, again, the natural but artistic grouping of the few twigs, and the breaking of the margin of the panels by a projecting catkin or bud, are very delightful. The backgrounds

of dead leaves to such plants as Solomon's Seal, Strawberry, *Orobus vernus*, and *Euonymus europaeus* are novel in design and charmingly harmonious in effect. If the artist excels in any one special point, perhaps it is in portraying berries with glittering high-lights upon them, as may be seen in those just splitting of the Euonymus, and also in the Black Bryony, Mistletoe, Hawthorn, Dog Rose and Arum. The blue Succory on its flaring background of ripe golden corn is startlingly audacious in design, but equally pleasing in effect. The sole exception is *Physalis Alkekengi*, which on its dead black background reminds one painfully of certain Italian mosaics in black marble Continental travellers at one time brought home with which to encumber drawing-room tables. The text is divided into three long chapters, describing the plants that would be found in rambles among meadows, hedges, and woods in spring, summer, and autumn, a chapter for each season, and the illustrations are arranged at the end of the book and in the order of the flowering or fruiting of the plants. One thing mars this book as a companion for the former: it is one-eighth of an inch taller, which prevents its going into a size of shelf that just holds the sister volume, and in which many other books on alpine plants can comfortably repose. A specially designed torture-chamber, in which the walls contract and squeeze the victim, should be ready for the publisher who turns out books on kindred subjects so variant in height as to necessitate their exile from their kith and kin on a distant shelf.

"Plantae Thonnerianae Congolenses." Série II. E. de Wildeman. xvii+465 pp. One map, 20 lithographic plates, 1 coloured pl., and 51 figs. in text. (Misch and Thron, Brussels, 1911.) 13.50 fr.

This second volume treats of the plants observed and collected by M. Fr. Thonner in the districts of Bangala and Ubangi of the Belgian Congo in 1909, during his second expedition in that region. This journey is shortly described by M. Thonner in the introduction, and the rest of the work is divided into three.

1. Geo-botanical Notes.
    Central Forest Zone.
    Northern Zone.
    Tabulation of distribution.
    Sudd plants.
2. List of plants collected by M. Thonner.
3. A systematic arrangement of the flora of the districts of Bangala and Ubangi.

Judging from the plates, the plants dealt with are mostly small-flowered and unlikely to be of horticultural value, but from a botanical point of view the full references to the older and the clear diagnoses of the many new species, together with the careful lists showing distribution, make this volume one of prime importance to a student of the plants of these districts of the Congo.

"Gardening in the Tropics," being a sixth edition of "Gardening in India," adapted for all tropical or semi-tropical regions. By G. Marshall Woodrow, late Professor of Botany, College of Science, Poona. 8vo., xvi + 634 pp., with 84 illustrations. (Gardner, Paisley, 1910.) 10*s*. 6*d*. net.

This handbook on gardening is chiefly remarkable for the wide scope of the subject which the author has attempted to cover. Not only has he dealt with such details as soils, climates, manures, methods of cultivation and propagation of plants, garden implements, insect pests, landscape gardening, exhibitions, plant-breeding, tropical garden-plants, rubber-yielding species, and so forth, but it is claimed that a careful study of the contents will enable readers to apply the information not only to a limited area, but throughout the extensive region in which the south-west and north-east monsoons prevail—that is, from Siam, through Burma, Ceylon, India, Central Africa, Abyssinia, Central America, and the West Indian Islands, and also the warm parts of South America.

The book appears to consist of a collection of loose notes that require re-shuffling in order to make a logical and connected whole. Cultivators in the tropics, however, are probably not so well catered for in the matter of gardening literature as we are in this country, and, provided they get the information they require, are doubtless less critical as to the manner in which it is presented to them.

The author, having the advantage of a practical knowledge of the subject of which the book treats, has clearly attempted to fulfil a want, and the fact that this is the sixth edition of the book is evidence of the fact that his labours are appreciated.

"The Rubber Planter's Note Book." By Frank Braham, F.R.G.S. 8vo., viii + 108 pp., with diagrams and illustrations. (Crosby Lockwood, London, 1911.) 2*s*. 6*d*. net.

The scope of this little book is best indicated by the sub-title:—"A handy book of reference on Para rubber planting, with hints on the maintenance of health in the tropics, and other general information of utility to the rubber planter, specially designed for use in the field, compiled from the most reliable and modern sources."

So much is known and has been written of recent years on the subject of rubber cultivation and production, that to give even a brief summary of the available information would occupy a fair-sized volume. It is obvious, therefore, that the book before us, consisting of some 100 pages of matter, and of a size suitable for the pocket, can only be considered as an introduction to more comprehensive works on the subject. Indeed, the author states in his preface that he has compiled the book for "the ordinary man and thousands of untrained assistants" who are in "absolute ignorance" of the subject, and that it is intended for the plantation assistant as a work of "reference and guidance in the field." So far as it goes the

information contained in the note-book appears to be reliable, and will probably be found of use by those for whom it is intended.

"Complete Yield Tables for British Woodlands and the Finance of British Forestry." By P. Trentham Maw. Obl. 8vo., 108 pp. (Crosby Lockwood, London, 1912.) 7*s.* 6*d.* net.

To compile yield-tables for British woodlands has been both an arduous and difficult task. That the want of such tables has, as the author says, long been felt, we are by no means prepared to say, for our comparatively small areas of woods and forests, rarely grown as they are for purely economical purposes, hardly warrant us, particularly with the very incomplete evidence as to the growth and yield of timber in this country which we possess, in tabulating the figures. The book is divided into four chapters—the two principal being devoted to yield-tables of hard-wooded and coniferous trees—is concisely and well arranged, and in a handy form for the office table or desk.

The principal timber-producing trees are dealt with separately, and in a list of parallel columns will be found such useful information as age of plantation, number of trees removed, distance apart, height, the average bulk and value of the trees at certain ages, as well as land-rentals and annual income from normally stocked forests.

In looking over these tabulated figures, we are at once struck by the low cubic contents and prices generally that are given for several kinds of timber. Take the poplar and ash, for instance; but, then, so much will depend on soil, altitude, and exposure, and local and other demand, as well as distance from rail or waterway.

Not long ago we sold a plantation of ash, forty-five years planted, the average cubic contents of the trees being much over 16⅓ feet, while the price received was 4*d.* a foot higher than recorded in these tables. But this only serves to show what a large number of returns from various localities are required to give a just average of the contents and selling price. We have found, too, that ash timber does not generally increase in value with age, the clean-grown, supple trees of from forty to sixty years' growth being far ahead in point of value of the older and generally rougher timber.

We have been wondering where the Sitka spruce can be found in sufficient breadths in this country to enable reliable statistics of growth and value to be tabulated; and our experience of the Weymouth pine in Wales is that it is ahead of the Corsican pine in the production of timber.

We are hardly prepared to accept the author's statement that afforestation must generally be looked upon in the light of a gamble. Far from such being the case, numerous returns have been recorded from England, Scotland, Wales, and Ireland that prove the opposite. There need be no gambling if the planting is done in a proper way and by those who have a practical knowledge of what they are doing. Unfortunately, this has not always been the case of British woodlands, the estate carpenter or gamekeeper having much to say in the question of trees and planting.

To the owner of woodlands or his agent this book should appeal, and we congratulate Mr. Maw on his laborious and well-planned work.

"A Popular Dictionary of Botanical Names and Terms, with their English Equivalents." By G. F. Zimmer, F.R.H.S. 8vo., vii + 122 pp. (Routledge, London, 1912.) 2*s*. 6*d*. net.

Many will find this a useful reference book, for it always adds to the interest of a name to know its meaning, and often assists the memory. The trivial or specific names of plants (omitting commemorative names) form the great bulk of the list, and as far as we have tested them the meanings are accurate and comprehensive. Perhaps a word of caution may be of service to those who have not greatly studied plant nomenclature. While plant names are often descriptive, their true intention is rather to designate than describe. This being so, we can conscientiously retain those descriptive names which were founded upon an error, which they commemorate and sometimes perpetuate. *Scilla peruviana*, e.g., has nothing whatever to do with Peru, and there are hosts of other similar examples.

We would suggest to the author that in the next edition he should add to the usefulness of his very useful book by indicating the pronunciation of the names.

"Deutsche Flora." By H. Cossmann. New ed. 8vo., 448 + xxix + 148 pp. (Ferdinand Hirt, Breslau, 1911.) Linen boards, 7.50 M.

This flora of Germany is also published in two parts, one containing the text, the other the plates, at 4.25 M. and 3.75 M. respectively. It is a light, neatly bound volume, slipping easily into the pocket and therefore convenient for use in the field. The text is in German, and short clear descriptions of the plants occurring in Germany are given, and for each family and for the larger genera useful "keys" have been arranged. The meaning and pronunciation of the names are indicated, and a brief note of the distribution of each species and its habitat completes the description. Two thousand four hundred and thirty-nine species are described, and a liberal view of the German flora is taken, for we find such plants as *Eschscholtzia*, *Weigelia*, and many other exotics included. The figures are excellent, clear, and accurate. They include large numbers of native British plants. We can heartily commend it to anyone desiring an elementary flora of Germany.

"The Life of the Plant." By Professor C. A. Timiriazeff. Translated from 7th Russian ed. by Miss Anna Chérémétéff. 8vo., xvi + 355 pp. (Longmans, Green, London, 1912.) 7*s*. 6*d*. net.

The translator has done her work admirably, and has enabled a first-rate work to become available for the English student who has no Russian—and how few have!

The theme of the book is plant physiology, and although the view-point of the author is perhaps not quite that of many plant physiologists

at the present day with regard to the nature of life, yet the book can be most profitably read and used by any student of that most important and most frequently neglected branch of botany—vegetable physiology.

"A Manual of Structural Botany." By Prof. H. H. Rusby, M.D. 8vo., viii + 248 pp. (Churchill, London, 1912.) 10*s.* 6*d.* net.

"A condensed but fairly complete introduction to botany," as the preface states, and, we may add, well printed and well illustrated. It is intended in the main for students in pharmacy, but others will find it a useful introduction to the structure and terminology of plant organs. A useful chapter on nomenclature and another on preserving specimens are added.

"Fungoid Diseases of Agricultural Plants." By Dr. J. Eriksson. Translated by Anna Molander. 8vo., xii + 208 pp. (Baillière, Tindall and Cox, London, 1912.) 7*s.* 6*d.* net.

Sir David Prain writes a preface to this new work, and the author's preface tells us that Mr. George Massee has read the translation with a view to checking the technical terms throughout.

The book deals with the principal diseases of the most widely cultivated plants, arranged according to the organisms that excite the diseases. beginning with the bacteria and proceeding to the higher fungi. It is extremely useful to have such a work from the pen of one of the most accomplished Continental authorities done into English. Diseases of Continental distribution are usually British as well, and a knowledge of the measures that have proved most useful on the Continent will certainly be at least suggestive here.

Only agricultural plants are dealt with, including the commonest vegetables; fruit, flowers, and such vegetables as beans, lettuce, and so on find no place.

The illustrations are an excellent feature of the book and number 117, three of them being coloured. Several of them have done duty in other works, but many are original, and all are well chosen and as typical of the diseases they purport to represent as black-and-white illustrations can be.

The difficulties of translation by one not thoroughly familiar with both popular and technical terms used in plant-disease nomenclature in both languages are obvious, and they have not altogether been evaded in this instance. *E.g.* p. 47, "copper vitriol" is now an unusual term for "copper sulphate"; "black pricks of corn-straw" (p. 101) and a few other "common" names of diseases have a very unfamiliar sound. Such instances as these, and little foreign tricks of expression (for the translator has not been able altogether to get away from the idiom of the original), detract somewhat from the value of the book to the practical man, but he will readily make allowances, and will find it most useful.

"Die Reizbewegungen der Pflanzen." By Dr. Ernst G. Pringsheim. 8vo., 326 pp., 96 figs. (Springer, Berlin, 1912.) M. 12. Bound M. 13.20.

For this book the author states it is intended less for the botanical specialist than for the plant-lover who observes the salient features of plant response to stimulation, and seeks to group together and to comprehend the phenomena before him without necessarily grappling with all the technical detail of the text-books. With this in view the illustrations are mostly photographs, giving a more life-like picture than drawings.

Whenever possible Dr. Pringsheim compares plant response with human sensibility, thus emphasizing the common basis of all living things. Despite the difference between plants and man, he says the same physical and chemical forces act on both as stimuli. Gravity keeps both upright. Light acts powerfully on both as a factor in orientation. Taste and smell guide us in choice of food; plant roots and fungoid threads reach out after their nourishment in virtue of chemical excitability; bacteria swim drawn by the same cord. Both react to mechanical stimuli—*e.g.* stroking or tapping—to rise and fall of temperature, to movements of water, and differences of moisture.

For plants *movement* is the least ambiguous reaction, and it is the main subject of this book. But other reactions also are described. *Change of form*, which plants manifest more conspicuously than man and animals generally. The plant organism, as a whole, is of much lower individuality. Its different parts accordingly respond by changes of form into stem, leaves, &c., in a degree that is not possible in the animal body. The *chemical reaction* of plants is more obscure. Recovery from wounds, growth of lost parts, is doubtless partly due to the working of internal stimuli, as well as to direct chemical action on metabolism. But this field has as yet been very imperfectly explored for man, and for plants the difficulties are infinitely greater.

The book, after preface and introduction, deals with the different orders of movements—*e.g.* free movement from place to place, movement of protoplasm, movements connected with growth, turgor, &c. It next treats of the different stimuli (gravity, light, temperature, mechanical and chemical factors), and of the several plant reactions. Lastly the nature of "Excitability" and its development are discussed—with a bibliography and index.

It should be a very interesting compilation for all who have not access to the original papers. The illustrations are excellent, and the discussion of the more obscure points of chemical action on plant metabolism is lucid and suggestive.

"Sub-Alpine Plants, or Flowers of the Swiss Woods and Meadows." By H. Stuart Thompson, F.L.S. 8vo., 325 pp. (Routledge, London, 1912.) 7*s*. 6*d*. net.

The need for such a book is so well stated in the opening words of the preface that their quotation here is irresistible.

"It is quite natural that most of the books on alpine plants have dealt chiefly with the higher zone of vegetation, and that consequently the flowers of the sub-alpine woods and meadows have been somewhat neglected. Therefore it is believed there is room for a book descriptive of the plants of the lower mountains."

M. Correvon lately issued a book on the flowers of the meadows and hedgerows of Switzerland, but the present volume takes in a wider field, and deals with plants of the Eastern, Central, and Western Alps. They are arranged according to their families, a concise but thoroughly practical and reliable description and a list of localities accompanying each specimen given, and occasionally cultural notes are added. The thirty-three coloured plates from drawings by George Flemwell are dainty and very accurate in colouring. The rather great reduction in size of these is not always flattering to the appearance of the flowers; for instance, such lovely gems as *Cyclamen europaeum*, *Veronica saxatilis*, *Viola biflora*, and *Saponaria ocimoides* look too small and weed-like to be admitted to gardens. *Ononis Natrix*, on Plate xvi, has no name attached, and in many cases it looks as though poor specimens had been used for models—*e.g.* *Lilium Martagon*, *Arnica montana*, and *Centaurea montana*. Otherwise the plates are pleasing—especially those with dark backgrounds, as Plate xxv, of Gentians. One great charm is the number of colour varieties represented. The plants of the higher zones are of course more interesting, but there are many of singular beauty among these inhabitants of sub-alpine regions, and they have a great claim on lowland collectors and gardeners, in their less fastidious behaviour and requirements in our gardens. Perhaps more lasting joy to the finder and benefit to gardens have followed the collecting of some good form of an easily grown plant than the acquisition of the difficult and delicate creatures of the high hills; and if this book stimulates the search for such it will do a good work.

"Roses and Rose Gardens." By Walter P. Wright. 8vo., 294 pp. (Headley, London, 1911.) 12*s*. 6*d*. net.

This is an excellent book for a present to a friend who is either a rosarian or who, we hope, may become one. It is well printed in clear type on good paper and contains numerous illustrations, some in colour and some as half-tone reproductions from photographs, and these, we think, are excellent. They are not only pleasing in themselves but give a good idea of the objects they depict. The coloured illustrations are to us less pleasing, being somewhat harsh in outline, and the reproductions of Miss Beatrice Parsons' pictures of rose gardens have suffered from this defect, while the colour pictures of roses, at least in some cases, scarcely do justice to the flowers they represent. (See, for instance, the pictures of 'Mrs. John Laing' and 'Horace Vernet.') Still, colour photography is a difficult art, as yet in its infancy, and its application to the rose is a severe test.

Mr. Wright is clearly a devoted admirer of the rose, and for this we

may perhaps pardon some expressions which are rather high-flown and a tendency to become diffuse. He is best when he gives us his own observation, as when he tells of the sport of the tits in the rose pergola, and of the shades of difference in the perfume of the rose, which may vary not only on plants of the same variety but even on different flowers on the same plant. After a chapter on the history of the rose and a glance at the different types and their classification, the author gives us a curious and interesting review of "Roses and Humanity," in which he includes a short account of the painters of the rose, a feature we have not before met with in an English work on the rose.

Following this we find several chapters dealing with the various operations of rose-growing, the places in which roses may be grown, rose gardens, soils, and manures, and the propagation, planting, and pruning of the trees, and other matters of cultural routine.

The author has furnished us with a useful chapter on the rose as a cut-flower, and we note with pleasure his appreciation of that wonderful rose 'Richmond' for this purpose, and of the general utility of 'Alberic Barbier' with its charming leaf sprays for arranging with other roses of delicate tints. He rightly lays stress on the importance of careful preparation of the flowers intended for decoration by cutting them young and plunging in water in a cool place over night before they are arranged in their vases.

A chapter of over twenty pages is devoted to the enemies of the rose, then follow others on roses in town gardens, sweet roses, and roses for various purposes, all containing copious lists of the varieties recommended.

An interesting chapter on the roses and the nations shows how the peculiar genius of the French for the production of new roses formerly held undisputed sway in this department, but latterly this claim to distinction has been challenged by the rose-growers of Great Britain, America, and Germany.

Then there is a calendar for rose-growers in which the operations to be followed month by month are set forth; and the book concludes with a chapter on "Too much alike Roses." We turned to this chapter with interest, and it was somewhat of a disappointment to find it contained little but the rather obsolete list of synonyms of the National Rose Society. Doubtless the author considers that the question is one that should be dealt with rather by the National Rose Society than by a private individual, but it is becoming urgent, and we share Mr. Wright's hope that the Society will consider the matter in the near future. Something has been done this year in bracketing together varieties which are to be considered alike for purposes of exhibition, but more remains to be done in this direction. Our author has appended to his book a reference table of varieties containing some 800 names with their type and colour, and a general index.

"A Book about Roses: how to grow and show them." By S. R. Hole, with an additional chapter and lists of roses by Dr. A. H. Williams. 8vo., 324 pp. (Arnold, London, 1911.) 3*s.* 6*d.*

Dean Hole's charming book on roses is too well known to need description. The numerous editions, from 1*s.* upwards, that have been brought out since its first appearance are ample proof of its popularity. Dr. Williams' new edition has given us an excuse for reading it again, and it is interesting to notice how well and thoroughly the subject is dealt with, and how little there is to add to the main part of the work. The Dean's roses no doubt have gone and are replaced by varieties possessing a greater continuity of flowering, but in our gardens we still have 'General Jacqueminot,' 'Gloire de Dijon,' 'Mrs. John Laing,' and 'Ulrich Brunner,' in their special characters scarcely surpassed by any modern roses.

Dr. Williams has wisely given us the Dean's book in its entirety, and what remains to be added is given by means of an appendix at the end of the book. Here we find something about the modern decorative roses, the hybrid teas, and the ramblers and Wichuraiana hybrids, and information about sprays and spraying. Here, too, are lists of the modern roses which have arisen since the Dean's day, those relating to the climbing roses (to which Dr. Williams has given much attention) being particularly well done. The last few pages contain some mistakes in spelling the names of the roses, which should be corrected in a subsequent edition.

"Spices." By Henry N. Ridley, M.A., C.M.G., F.R.S., F.L.S., Director of the Botanic Gardens, Straits Settlements. 8vo., ix. + 449 pp. (Macmillan, London, 1912.) 8*s.* 6*d.* net.

A reliable book on spices was much needed, and Mr. Ridley's book goes a long way towards supplying that want. The history of spices contains much that is romantic and adventurous, but Mr. Ridley has not concerned himself with that side of the subject; he has dealt with it strictly from the planting point of view. The introductory chapter gives a concise account of the general principles underlying the cultivation of tropical spices, and particular attention is given to the descriptions of the composition and uses of insecticides and fungicides. Following this are thirteen chapters which describe the cultivation and preparation of vanilla, nutmegs and mace, cloves, pimento and allspice, cinnamon, cassia bark, massoi bark, black peppers, long pepper and grains of paradise, cardamoms, capsicums or chillies, coriander, dill and cumin, ginger, and other rhizomatous spices, such as turmeric, zedoary, galangal, and calamus root. On each of these subjects there is full and useful information both for the planter and general reader, and in most cases statistics are furnished showing the extent of the trade in these commodities. The book is well printed on good paper in generous type, but the weak point is the illustrations. In these days of photography and cheap process-blocks it is neither difficult nor expensive to illustrate fully a book of this nature, and, in view of the details of cultivation

described in this book that lend themselves to illustration by photography, it is much to be regretted that more illustrations are not included. We hope that in future editions this point will receive attention.

"The British West Indies: their History, Resources, and Progress." By Algernon E. Aspinall, Secretary to the West Indian Committee, 8vo., xii + 435 pp., with illustrations and a coloured map. (Pitman, London, 1912.) 7*s*. 6*d*. net.

The author of the valuable little "Pocket Guide to the West Indies" is responsible for this comprehensive account of our possessions in the Caribbean Sea, commonly spoken of as the British West Indies. In reality these possessions comprise eight colonies, if British Guiana, on the north-east coast of South America, and British Honduras, on the east coast of Central America, are included in the term, as for administrative purposes is the case. Of the more important West Indian islands belonging to Great Britain Barbados is the only one which has remained in the undisputed possession of England since its first settlement. The history of all the others "has been written with the sword's point." Well may the author ask, "What other colony can boast of such a varied and romantic history?" for these islands, discovered by Columbus, were the scenes of the daring exploits of the renowned Elizabethan seamen—Raleigh, Hawkins, Drake, and others—and in more recent times, of those of Benbow, Rodney, Hood, and Abercromby; and it was in the West Indies that Nelson chose his bride. Following a narration of the stirring events connected with the early history of the West Indies, the author proceeds to describe the flora and fauna and points out that, with regard to the former, the staple products of the West Indies are not derived from native plants, but from exotic species—for instance, the sugar-cane, cacao, coffee, cinnamon, nutmeg, banana, orange, and ginger are introduced plants. Incidentally it is mentioned that the beautiful maiden-hair fern, *Adiantum farleyense*, is so named from its having been first grown at Farley Hill, the residence of Sir Graham Briggs in Barbados. In British Guiana, too, the noble water-lily, *Victoria regia*, was discovered by Sir Robert Schomburgk, and he it was who directed public attention to its beauties. The most interesting members of the West Indian fauna, so far as European commerce is concerned, are the turtles, which are found more or less throughout the islands.

Much useful information is given concerning the climate, cost of living, opportunities for settlers, and other matters, which will be read with interest by those who anticipate visiting or settling there.

Perhaps the most interesting part of the book is that which deals with the industries of the West Indies. These for the most part are agricultural, but there are also several important industries concerned with the exploitation of petroleum and pitch in Trinidad, and in British Guiana gold and diamonds are found, and timber, rubber, balata, and other forest-products figure in the exports. The sugar

industry has played an important part in the history of the West Indies, and the evil times which befell the sugar-planters on the abolition of the slave trade in 1807 and the crisis which followed the abolition of slavery in 1834 are matters of history familiar to most readers, but which would pay perusal again as set forth in the pages of this book. It is gratifying to learn that the West Indian sugar industry has now entered upon a new lease of life and that the prosperity of Canada has done much to bring about the revival of the industry. Almost like a fairy-tale is the account of the West Indian banana industry, which began about 1865, in which year 1,758 bunches of bananas were exported, and reached to 16,712,220 bunches last year. The cultivation of limes and other citrus fruits, cotton (the famous "Sea Island" variety had its original habitat in Barbados), rice, coconuts, nutmegs, and cacao are other industries described. Turning to the mineral industries, the exploitation of the famous pitch-lake of Trinidad is one of the romances of modern industrial development, and petroleum, which is now being exploited in Trinidad, promises soon to furnish another example. Succeeding chapters deal with many subjects of political or topical interest. Not the least important of these is the chapter concerned with discussing the West Indies and the Panama Canal. In the author's opinion, the West Indies should be able to derive a great advantage from this gigantic undertaking. It will be seen from the foregoing sketch of the principal contents of this volume that the subject is one that must appeal to all Englishmen, and a perusal of the 435 pages of matter should result in the reader being well informed as to the past history, present condition, and future prospects of those portions of the British Empire included in what are termed "the British West Indies."

"How to Make an Orchard in British Columbia; a Handbook for Beginners." By J. T. Bealby. 8vo., 86 pp. (Black, London, 1912.) 1*s.* 6*d.* net.

Now that so many are turning their attention to Canada, and especially to British Columbia, this book will be particularly welcome to the intending emigrant. It is written in clear, plain language, and tells how to select suitable land, how to clear and plant, what varieties to select, and how to cultivate the orchard. Information is given as to the prices of land, cost of outfit, markets, Government assistance, climate, and other matters the settler will be anxious to know. There are many points worthy of study by the fruit-grower in the book, for our home growers as well as those about to settle in British Columbia. Great stress is laid on the selection of suitable land, and without this failure is almost assured. Hence the importance of seeing for oneself the ground before purchasing. Another matter of great importance is the selection of a site where there is a free circulation of air, for in a mountainous country like British Columbia "wind still" localities are more frequent than in Britain. There they are termed "frost pockets," and are most carefully avoided by the experienced

fruit-grower. And the author justly remarks: "Air-drainage is as essential to the foliage of fruit trees as soil-drainage is to the roots." The cost of land naturally varies very much—proximity to railways, roads, cost of clearing, and so forth—but raw land ranges from 50 to 250 dollars the acre in small lots, but less for large blocks, and orchards in bearing realize from 500 to 1,000 dollars the acre. The cost of ten acres, including clearing, house, buildings, fences, stock, tools, seeds, &c., the author roughly estimates at 6,050 dollars; but as a rule small blocks of this size may be paid for on the instalment system, say one-third cash down and the balance by arrangement, not less than 6 per cent. interest being charged.

Taxation seems to be very light. The author says: "As a fruit-rancher the orchard-owner pays only one tax and no rates whatever. The tax is a levy of ½ per cent. upon the assessed value (say 80 per cent. of the actual market value) of his real property, with a 10 per cent. discount for prompt payment."

Small fruits are evidently a paying crop. Strawberries, raspberries, and black currants appear to pay best if near a market or jam factory. Potatos are stated to be the most remunerative root crop, and other catch crops are described carefully. An excellent chapter on manures might be read by British growers with profit. Now that manure is becoming more difficult to obtain, the grower will be obliged to pay more attention to other forms of manuring, and we cannot do better than quote one paragraph from the chapter, viz.: "The system of clean cultivation during the summer, followed by a cover crop in the fall and winter, will not only keep right the texture and quality of the soil, but will give the trees all the fertilizing agents they want." A first-rate chapter on pruning is also well worthy of perusal, and the chapters on spraying, &c., are all very good, but our experience is that fruit trees in this country will not stand Paris green at the rate recommended in Canada—viz. one ounce to ten gallons of water. Half that strength is sufficient and safe if the whole is kept well agitated while using it. A great deal of other information is given, all of interest and value to the intending settler. The book is well printed and well indexed.

"The Single-Handed Gardener." By Special Experts in both Indoor and Outdoor Gardening. 8vo., 260 pp. (Temple Press, London, 1912.) 1*s*. net.

This is one of the cheapest and most comprehensive books on gardening that we have yet seen. Almost every subject conceivable is treated in a masterly manner, and the book is one that every amateur and every gardener in a small place should possess. The printing and illustrations are very good, and the same applies to the index at the end.

"Everybody's Gardening Book." By the Editor of *Garden Life*. 8vo., 278 pp. (Garden Life Press, London, 1912.) 1*s*. net.

Of cheap gardening books there is no end; but at the same time there is plenty of room for such a good, practical work as the one

before us. The author deals principally with outdoor gardening in all its many phases, although frames and greenhouses are by no means overlooked, and a first-rate calendar of operations needed from January to December is given. The printing and illustrations are all satisfactory, and a capital index completes the book.

"A Year's Gardening." By Basil Hargrave. Crown 8vo., 272 pp. (Laurie, London, 1912.) 6*s*. net.

This book is admirably got up, well illustrated, and excellently printed. The calendar of operations for each day of the year is most carefully arranged, and the various chapters on cultivation and other information concerning the garden are all thoroughly practical and worthy of careful perusal. The book will be equally valuable for the amateur or professional gardener.

"The Guild of the Garden Lovers." By Constance O'Brien. Crown 8vo., 240 pp. (Routledge, London, 1912.) 3*s*. 6*d*. net.

A very well-written book, boldly printed, with sixteen illustrations and a good index.

"My Garden Companion; a Handbook for Amateurs and Others." By Donald McDonald. 8vo., 101 pp. (The Cable Publishing Co., London, 1905.) 1*s*.

Thirty practical articles on gardening by this well-known writer appeared originally in the *Daily Telegraph* and are now published in book form. The usefulness of the book is increased by numerous illustrations. It is an admirable little book.

"How to Grow Sweet Peas." By Thomas Stevenson and W. F. May. 8vo., 64 pp. (The Cable Publishing Co., London. [1912].) 6*d*. net.

Everyone is well acquainted with Mr. Stevenson's great success as a grower and exhibitor of Sweet Peas, and his writings on this popular flower are very welcome.

"The Canna and How to Grow it, with a Chapter on Sub-Tropical Plants." By B. C. Ravenscroft. 8vo., 93 pp. (The Cable Publishing Co., London.) 1*s*.

So far as we know this is the only book published dealing with this beautiful plant. The information on its culture, storage, hybridizing, &c., is excellent, and the descriptions of varieties are all that one could wish.

"Beautiful Flowers and How to Grow Them." By Horace J. Wright and W. P. Wright. Two volumes, 4to., 200 + 202 pp. (Jack, London, 1909.) 31*s*. net.

This work is admirably printed and most artistically got up, and contains one hundred coloured plates by such talented artists as Beatrice

Parsons, Eleanor Fortescue Brickdale, Anna Lea-Merritt, Hugh L. Norris, Lilian Stanard, Margaret Waterfield, A. Fairfax Muckley, and Francis E. James. Needless to state, they are beautifully done and add immensely to the value of the book, which is fit for any drawing-room table. The first volume is devoted to Roses, bulbs, herbaceous plants, rock plants, stove and greenhouse plants, and window and room plants; while the second volume is devoted chiefly to Carnations, Dahlias, Sweet Peas, annuals, aquatic plants, arches, pergolas, and stumps, beautiful walls and fences, Orchids, Chrysanthemums, tender bedding-plants, and flowers for suburban gardens. It will be seen from the above how comprehensive these two volumes are and how they embrace almost everything in large, medium, or small gardens. The matter is thoroughly sound and practical, and we can confidently recommend the work to anyone owning a garden.

"The Amateur Exhibitor's Guide." By George Garner. 8vo., 167 pp. (The Cable Publishing Co., London, 1912.) 1*s*. net.

A useful little book for the amateur, containing cultural hints for the exhibitor and the principal points to aim at in exhibiting vegetables, fruits, and flowers, the Royal Horticultural Society's rules being freely quoted. In the collections of fruit we do not agree with the author's selection of dishes. In collections of six and nine kinds he only mentions one variety of grapes, but in all the schedules we have both black and white grapes are allowed for exhibition purposes, and this is as it should be. A good index is provided.

"Roses." By H. R. Darlington. 8vo., 193 pp. (Jack, London, 1911.) 2*s*. 6*d*. net.

A thoroughly practical book by a well-known rosarian, and published at a price within the reach of all. Everything relating to Roses seems to have been thought of and dealt with by the author. Such subjects as soils, varieties for beds and borders, the preparation of beds, the arts of pruning, manuring, exhibiting pillar roses—in fact, all types of roses, including those for the rock garden—are all treated in a masterly manner. On the vexed question of pruning the author is very clear and concise, indicating exactly how the different classes should be pruned, without being at all dogmatic. The book is well up to date in varieties. Some of the newer ones are not mentioned for the simple reason that they have not yet been sufficiently tested to warrant a definite statement as to their habits and qualities in the open air, but on the subject of pests and diseases the book is more up to date than any other work we have seen on Roses, and we are very pleased to see Mr. Darlington mentions those insects and flies that feed on or destroy the insect foes that infest the Rose, such, for instance, as Ladybirds, Ichneumon flies, Horse-flies, and Lace-wing flies. In many parts of the country the labourer firmly

believes that the Ladybird breeds Greenfly, and promptly smashes every one he sees. Many very good remedies are recommended for the pests and diseases so well known to rose-growers, and we endorse the excellent advice of the author to destroy the pests immediately they appear before they have a chance of increasing. Much more might be said of the contents of this valuable book, but quite enough has been said to show that no rose-grower should be without it.

"The Gardener and the Cook." By Lucy H. Yates. 8vo., 260 pp. (Constable, London, 1912.) 3*s*. 6*d*.

This is a brightly written, well illustrated book which tells of two people who, although neither vegetarians nor fruitarians, had of necessity to subsist chiefly on vegetables and fruit, and who, to this end, took an old house in Sussex with an exceptionally well situated kitchen-garden of nearly two acres, and forthwith engaged Charlemagne and Charlotte (the gardener and the cook), two delightfully interesting and adaptable persons who will make many a sorely-tried housekeeper envious of the authoress's good fortune in securing, in these difficult times, so accommodating a couple.

By careful management and due consideration to the wise rotation of crops they were enabled to obtain a constant supply of the better-class vegetables and salads all the year round, which Charlotte, being French, utilized to perfection.

The book contains excellent and unconventional recipes for the preparation of delicious and quite uncommon dishes, and there are chapters on drying, preserving, and storing herbs, fruit, and vegetables for the winter season.

"Sundials and Roses of Yesterday." By Alice Morse Earle. 8vo., 461 pp. (Macmillan, London and New York.) 10*s*. 6*d*. net.

To the average individual whose taste, perhaps, runs to collecting coins or postage stamps, the accumulation of ancient sundials must seem a heavy and ponderous occupation, but Mrs. Earle has apparently derived much enjoyment from her hobby, and has given us a very interesting book on the subject, profusely illustrated with excellent photographs and drawings. Her description of many old English dials, with their quaint mottos and inscriptions, is most entertaining, and makes very pleasant reading for a winter's evening, when one can in imagination stroll through many an old garden with its "double row of hollyhocks, spires of flame and rose-colour, white and crimson, and bunches of golden Aaron's rod and Canterbury bells, and bee larkspur and prince's feathers, and, later in the year, tufts of purple, golden-eyed Michaelmas daisies, and, at the end of all, upon a lump of turf, a grey time-tinged sundial" marking the sunny hours. Many of us would like to have a "time-tinged" dial embellishing a rose-walk in spite of the fact that a sundial only records the true noon four times a year.

"Potato Cookery: 300 Ways of Preparing and Cooking Potatos." By Alfred Suzanne and C. Herman Senn. 8vo., 124 pp. (The Food and Cookery Publishing Agency, Westminster, S.W., 1907.) 1*s.* 6*d.*

This is a book which ought to have a place in every kitchen.

So little thought is usually given to the cooking of potatos in England that boiled, baked, and fried are almost the only ways we can get them served in the home. Too often they are quite uneatable, being either sodden or undercooked, even where an experienced cook is kept.

The 300 recipes the book contains speak for themselves. There is an interesting preface by Mr. J. C. Buckmaster, which tells of the history and origin of the potato, its chemical composition and food value, with descriptions of its cultivation and the diseases, &c., it is heir to.

"Outlines of Evolutionary Biology." By A. Dendy, D.Sc., F.R.S. 8vo., 454 pp. (Constable, London, 1912.) 12*s.* 6*d.* net.

This work is mainly composed of descriptions of animal life, the types being chosen in an ascending series from the amœba to mammalia; but it is much more, in that the author deals with a vast number of questions touching evolution. Thus he begins with the "nature of life" and quotes Spencer's words, it is "the continuous adjustment of internal relations to external conditions." But this is only what is observable; the question remains, What *causes* the adjustment or adaptations, as they are now called? The author defines Life as the "sum total of all the activities which it exhibits." Still the question remains, Why have all its activities a *purpose*—*e.g.* such purposes maintaining existence and propagation? Again, he says "Life is a manifestation of energy." We should prefer to say "Life reveals itself by manifestations of energy," but it differs from inorganic energies by its abundant *purpose* under changes of structure. Life is, in fact, a director of energies, which in themselves are not living, but act under direction upon inert matter; and so builds up purposeful structures.

The various descriptions of typical animals are excellent, and the illustrations admirable; but the author is not quite equal in his reference to plants. He follows, *e.g.*, too closely Darwin's earlier views of the importance of crossing flowers. No botanist now accepts the position of self-fertilization being harmful. Indeed, if production of seed be the most important "end" of plant-life, self-fertilizing species are by far the most prolific, and are also perfectly healthy.

The author quite accepts the heredity of acquired characters. It would, indeed, be quite impossible to account for heredity of new variations without it.

He seems to accept De Vries' idea that mutations appear after long intervals; but he pertinently adds they will not account for marvellous adaptations in plants especially in the floral structures. He does not,

however, observe that De Vries' mutants are simply what might be expected in changing the conditions of his Oenotheras from "almost pure sand" to a "highly manured garden." Such was evidently the direct *cause* of his mutants.

With regard to natural selection as a factor of evolution, he would see some use for it, although variations may be caused by a changed environment; but Darwin separated these two factors. He said that changed conditions induced "definite" *or* "indefinite" results. If the former prevailed, then a new variety arises *without the aid of any selection*. Ecology has shown that this is all that is required; and that no "indefinite" variations ever arise in Nature at all.

With the above few criticisms the reader will find a vast amount of information clearly put, and evolution substantiated.

"Studies in Seeds and Fruits." By H. B. Guppy. 8vo., 528 pp. (Williams & Norgate, London, 1912.) 15*s*. net.

This book is an "Investigation commenced as a study of the rest-period of seeds; but its course has often been determined by small indications, the balance and the oven, aided by a sharp knife and a pocket-lens, being the only means of research employed." Without reading more than this first sentence of Chapter I., one asks, Why has he not got anything to say of the chemistry of the resting period and the importance of the microscope instead of a lens?

No one will deny the great value of the enormous labour and valuable results bestowed and registered on the water contents of seeds at different periods; but the chemical question arises, What portion of the loss of weight is due to respiration, to the loss of carbon besides water? Can any seed live in a vacuum, and if so for how long a time? Again, one of the many interesting studies which the author describes is the coloration of seeds. How far the various colours are connected with enzymes in oxidizing processes one would like to know; but a chemist would find much help, we think, from Mr. Guppy's researches.

The wings of seeds and fruits are usually regarded as special *purposeful* means of flight; but doubts have long ago been raised; for while the familiar one of the dandelion impresses the imagination strongly, far more of the Compositae are unprovided with this aid to flight. Mr. Guppy comes to the conclusion that they are helpful in supplying water to the seed in the growing state.

The author quotes Goebel's view as follows:—"Many arrangements which have hitherto been considered merely as a parachute-apparatus on the ripe fruit are in my view to be considered as a transpiration-apparatus for the ripening fruit; and these subsequently can be used for dispersal."

Another curious discovery was that the ivy and oak can be more or less viviparous; by the seed not entirely drying up, it retains its growing properties in the seed itself. Illustrations show that the embryo of the ivy enlarges after the fruit is completed.

The above will be sufficient to show that besides the many tables of

statistics, &c., very much will interest the scientific botanist; though he may not accept the author's speculations of what goes on in other worlds in the last chapter.

"Manures for Garden and Farm Crops." By W. Dyke. Ed. by T. W. Sanders, F.L.S. 8vo., 116 pp. (Collingridge, London, 1911.) Paper boards, 1*s*.

This is an excellent little book giving a clear and concise statement of the reasons for manuring and directions for the use of manures for a variety of crops, and the author's experience will ensure that these are a safe guide, so far as a book can give one.

The only complaint we have to make is in reference to a little want of care in revising parts of it. For example, on p. 73 we find an analysis of magnesium limestone is given which is 10 per cent. out; p. 76. "compounds of salt" used apparently for some other term; "dwarf runners" on p. 97; and so on.

We should like to have seen some reference made to the difficulty experienced in using nitrate of lime.

"The Story of the Soil." By C. G. Hopkins. 8vo., 350 pp. (Laurie. London, 1912.) 6*s*. net.

The preface begins "Truth is better than fiction," and the author endeavours to prove his dictum by giving the story of modern agriculture as it is understood in the States in the form of a novel. That is to say, there is a hero and a heroine, conversations and letters, and so on. But the conversations are improving speeches freely interlarded with statistics and even chemical equations, and the letters are the same. So that read as a novel one soon tires, the speeches pall and the "situations" are poor. Read as a book of instruction one could scarcely wish for anything better, but one sees little use in the small amount of "scenery" introduced.

"Manures that Pay: How to use them profitably in Garden, Field, and Orchard." Compiled by W. C. Sambrook. 8vo., 82 pp. (Cable Publishing Co., London.) 6*d*. net.

A series of notes on the principal chemical fertilizers and of quantities to use for various crops on different soils is given in plain language. Care must of course be exercised in following the suggestions made, otherwise much good material may be wasted. We should like to have seen some warning against the continued use of such acid manures as superphosphate and sulphate of ammonia on soils containing but little lime, and on p. 78 the *residue* left after treating calcium carbide with water is meant instead of "carbide of calcium."

"Tree Lore." By F. G. Heath. 8vo., 304 pp. (Kelly, London, [1912].) 3*s*. 6*d*. net.

This is a book of short notes arranged alphabetically and apparently taken from the commonplace book of a naturalist. They are more or

less about trees, British and foreign, but have no sequence. A little more care might well have been expended in correcting the botanical names of the plants mentioned, and the "fungus" which forms the frontispiece is apparently not a fungus at all, but the well-known 'Rose de Madera.' It is a book rather for those who like curiosities than for the serious student.

"Gardening for the Ignorant." By Mrs. C. W. Earle and Miss Ethel Case. 8vo., xxiii + 232 pp. (Macmillan, London, 1912.) 1*s*. net.

This little book is written for the beginner in language he can understand, and out of the fulness of their experience and love for their gardens of the authoresses. We can warmly commend it to the novice, although one or two of the recommendations made we hardly think quite wise—*e.g.* four inches apart for onion drills gives no room for hoeing. What to do month by month is very clearly set out for all departments of the garden.

"Perpetual Carnations: A Complete Manual, with all Details of Cultivation." By L. J. Cook, F.R.H.S., 8vo., 101 pp. (Cassell, London, 1912.) 1*s*. 6*d*.

Little concerning the perpetual flowering Carnation is omitted from this little book. The "American" Carnation has made great strides since its reintroduction to Europe and is admired by almost everyone. Some find difficulty in growing it, but their difficulties will fly like chaff before a gale if they follow the directions so clearly set out here. Good descriptive lists of varieties and notes on diseases and pests are given.

"Elementary Plant Biology." By J. E. Peabody and A. E. Hunt. 8vo., xvi + 207 pp. (Macmillan Co., New York, 1912.) 4*s*.

This is an elementary botany book written from a biological standpoint and intended for school-children. It is well done, except that there are perhaps an unnecessarily great number of technical terms employed. Many directions for experiments have been introduced, and the book is well and copiously illustrated.

"The New Gardening." By Walter P. Wright. 8vo., 400 pp. (Grant Richards, London, 1912.) Price 6*s*. net.

The author very truly describes this book as a guide to the most recent developments in the cultivation of flowers, fruits, and vegetables, and it is a capital blend of sound practical information with a pleasing literary style. The six illustrations in colours, and forty-eight in black and white, combined with good paper boldly printed, makes the work an attractive and handsome production, and readers will find a fund of first-rate information, all well indexed.

EXAMINATIONS IN HORTICULTURE, 1912.

General Examination.

March 27, 1912.

Seniors: *over* 18 *years of age.*

Two hundred and two candidates entered for the Society's Senior General Examination, held on March 27, 1912. Five of these, however, did not present themselves on the date appointed.

The Examiners, the Rev. Professor G. Henslow, M.A., V.M.H., and Mr. James Hudson, V.M.H., report that of the Senior candidates obtaining a place in the Pass List, 14, or 7 per cent., were placed in the first class; 42, or 21 per cent., in the second class; whilst 122, or 62 per cent., appeared in the third class. Nineteen candidates failed to secure sufficient marks to appear in the Pass List.

Speaking generally, too much praise cannot be given to the candidates who obtained the highest places in the list. Their excellent answers exhibited close study and much thought, especially in the principles of horticulture.

Juniors: *under* 18 *years of age.*

One hundred and fifty-four candidates entered for the Junior Section of the General Examination. Of these two were absent, and three were disqualified for bringing notebooks into the examination-room. It may be added that the Examiners noticed several cases where answer-papers bearing consecutive numbers seemed to indicate copying, from the great similarity of the answers. Students learning from the same tutor often clothe their answers in much the same way, and give the same examples to illustrate their remarks. The examiners would prefer to find originality and the expression of a candidate's own individuality in the answers given, as these things command higher marks.

The Pass List shows 4 Junior candidates, or 3 per cent., to have obtained a first class; 12, or 8 per cent., a second class; 24, or 16 per cent., a third class; and 82, or 54 per cent., a fourth class—leaving 27 candidates unsuccessful.

Candidates should give greater care to their spelling, especially in the case of plant names and botanical terms; these difficult words might be made subjects for handwriting lessons, whereby the constant repetition of the same words would impress the memory correctly.

The Examiners were caused much unnecessary difficulty by candidates placing the letter "A" to a Section "B" answer, and vice versa, "B" to a Section "A" answer.

W. Wilks, *Secretary.*

SENIORS.

Class I.

1. Brunton, A. S. A., Horticultural College, Studley.
2. Sleightholme, H., Yew Bank, Caistor, Lincs.
3. { Bagnall, D., Horticultural College, Swanley.
   Cochrane, L. G. M., Horticultural College, Studley.
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6. { Price, E., Horticultural College, Swanley.
   Rudolf, M., Horticultural College, Swanley.
8. { Ferguson, T. G., Horticultural College, Studley.
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EXAMINATION OF SCHOOL TEACHERS IN COTTAGE AND ALLOTMENT GARDENING, 1912.

April 27, 1912.

One thousand and eighty-nine Candidates entered for the Examination of School Teachers in Cottage and Allotment Gardening, held on April 27, 1912, being an increase of 592 over the entries for 1911; 106 obtained sufficient marks for a first-class, 702 for a second, and 209 for a third, leaving only 30 failures, 41 absentees, and one Candidate who was disqualified for consulting notes.

The Examiners, Mr. F. J. Chittenden, F.L.S., Mr. John Fraser, F.L.S., Mr. Alexander Dean, V.M.H., and Mr. C. R. Fielder, V.M.H., report that, generally speaking, the answers returned showed an intelligent grasp of the subjects of the questions. The questions on vegetable cultivation, especially, produced very practical answers, and were awarded correspondingly high marks. It is, however, surprising that so many Candidates would make up a *hot*-bed with *well-rotted* manure.

The Examiners notice that the word "born" is much used in reference to the germination of seeds. The term is by no means a good one, for, as a rule, it applies to animal life and not to plant life. Want of *practical* knowledge was very apparent where Cyclamen, Lobelia, and Snapdragon were given as subjects suitable for training on a cottage wall! There was a similar want of knowledge, or thought, in recommending arsenical washes for currant and gooseberry bushes attacked by caterpillar.

Question 10 was well answered and diagrammatically illustrated, but in a large number of cases it was suggested that *all* the soil should be excavated within a given distance from the tree, instead of *taking out a trench* only at a certain distance. A still greater fault was the recommendation to use manure freely in refilling the trench, as this might be expected to reproduce the very condition of unfruitfulness and gross growth which it is the object of root-pruning to counteract.

In Section B a greater proportion of the Candidates showed an appreciation of the principles concerning which questions were asked than in previous years; but, even so, there was still on the part of many a lamentable lack of the power to apply principles to practical gardening. Questions in Section B are designed to test how far the

simple facts of plant physiology and structure, and of the nature of the soil, are really grasped by the student—grasped, that is, in such a way that they can be actually utilized in garden work. These questions cannot be adequately answered by those who have only read books. They require observant acquaintance with the things themselves, and intimate knowledge of the way a plant "works."

Perhaps the commonest mistakes were in saying that a plant is variegated because it does not receive sufficient carbon-dioxide; that hoeing "fills up the capillary tubes"; that the cabbage white butterfly pupates in the soil; and in confusing transpiration with respiration. Such errors result in mistakes in cultivation if an attempt is made to apply them.

W. WILKS, *Secretary.*

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Ackerley, G., 71 Albert Street, Crewe.
Allwood, J., Staverton Road, Daventry, Northamptonshire.
Boulton, J., School House, Longnor, Buxton.
Brashier, R., School House, Compton Dundon, Somerton, Somerset.
84. Cooper, J., Lyndene, Park Avenue, Castleford, Yorks.
Hammond, H., 13 Eastleigh Road, Narboro Road, Leicester.
Scott, T., 10 West View, Bedlington Station, Northumberland.
Thompson, E. W., 33 Priory Avenue, High Wycombe.
Wicks, P., 28 West Street, Grimsbury, Banbury.
Williams, H., 14 Palace Gardens, Enfield, N.

Cooper, G., 45 Borneo Street, Walsall, Staffs.
Crozier, C., 25 Alverstone Avenue, Birkenhead.
Hamnet, R., 14 Grosvenor Avenue, Oakhill, Stoke-on-Trent.
Hawthornthwaite, M., Wede Park House, Dipton, Durham.
King, A., School House, Deerhurst, Tewkesbury.
Love, G., Eye Green, Peterborough.
94. Parkinson, E., School House, Somersham, St. Ives, Hunts.
Phillips, A., Montford House, South Collingham, Newark.
Stevens, C., 282 All Saints' Road, Wolverhampton.
Stokes, A., Stanley Park, Brightlingsea, Essex.
Sutton, J. F., School House, Old Swinford, Stourbridge.
Tyler, H., School House, Wrangle, Boston, Lincs.
Wilkes, A., The Lilacs, Horsehay, Shropshire.

Class II.

Bartrop, H., 444 Bloxwich Road, Leamore, Walsall.
Glover, G., School House, Enstone, Oxon.
Harding, R., Industrial School, Shustoke, Birmingham.
Hardwick, R., 33 Scarboro' Street, Irthlingborough, Northants.
Janes, R., Cromwell House, Burton Latimer, Kettering.
Jones, E., Palmacotta, Alma Road, Carshalton.
Mayes, W., 151 Chalkwell Road, Milton Regis, Kent.
1. Moore, T., 20 Waverley Road, South Woodford, Essex.
Odgers, J., Leedstown School, Hayle, Cornwall.
Powell, E., Copston Magna School, Hinckley, Leicestershire.
Powell, W., Eckington Villas, Market Street, Kingswinford.
Richold, R., Messing School, Kelveden, Essex.
Southgate, R., 14 Frome Hill, Radstock, Bath.
Tipton, C., Manor School House, Coalpit Heath, Bristol.
Webster, M., 129 Clarence Road, Grays, Essex.

Auburn, N., Biskey Howe Gardens, Bownesson, Windermere.
16. Barwell, H., 7 Cyprus Terrace, Burgoyne Road, Sheffield.
Billingham, F. J., Trinity School, Henley-on-Thames.

Brears, P., 19 Albany Road, Manor Park, London, E.
Bromwich, A., Glenavoin, Coleshill Road, Sutton Coldfield.
Child, H., 22 Wood Street, Fallings Heath, Wednesbury.
Clegg, T. H., B.A., School House, Old Newton, Stowmarket.
Cooper, A., 21 Bent Street, Brierley Hill, Staffs.
Dyer, C., 25 Downend Road, Fishponds, Bristol.
Edwards, D., Cwmduad Council School, Cynwyl Elfed, Carmarthen.
Fisher, T. W., Billesdon, Leicestershire.
Fitzjohn, H., 35 Bamber Street, Peterborough.
Gill, L. H., 10 Henry Street, Huddersfield.
Hawbrook, G., 47 George Street, Grantham, Lincs.
16. Henderson, A., 23 Union Road, Tufnell Park, N.
Hobson, T., 52 Walter Street, Brierfield, Lancs.
Hughes, L., School House, Pool Quay, Welshpool.
James, W., 35 Pinhoe Road, Exeter.
Jones, H., High Hatton School, Shrewsbury.
Marchant, P. J., 46 Fambridge Road, Maldon, Essex.
Palliser, J., 55 Murray Street, Holgate, York.
Pearson, W., School House, Hilperton, Trowbridge.
Pickles, A., 42 Mytholmes Lane, Haworth, Keighley.
Rogers, W., 65 Showell Road, Bushbury, Wolverhampton.
Turnbull, J., School House, Ilam, Ashbourne.
Young, G., 35 Alfred Street, Shrewsbury.
Bailey, W., 30 Wheathill Road, Anerley, S.E.
Bird, D., School House, Longcot, Faringdon, Berks.
Bournes, A., Una Villa, Sturry, Canterbury.
Chilton, E., Crowgate Hill, South Anston, Sheffield.
Figgins, R., 23 St. Andrews Road, Portslade, Brighton.
Garside, A., Ash Dene, Copmanthorpe Lane, Bishopthorpe.
Gyte, P., Schoolhouse, Offord D'Arcy, Hunts.
Haysom, A., Chislet School, near Canterbury.
Jay, A., 5 Avondale Place, Shaw Road, Bushbury, Wolverhampton.
Miskin, E., The School, Foulness, Shoeburyness.
42. Oglesby, F., 120 Farnan Avenue, Forest Road, Walthamstow.
Potter, F., Waterworks, Henley-on-Thames.
Rippiner, G., 65 Braybrooke Road, Desborough, Market Harboro'.
Rowbotham, J., School House, Eastington, Stonehouse, Glos.
Shorter, G., Clewer Green School, Windsor.
Simcock, H., 60 Leek Road, Stockton Brook, Stoke-on-Trent.
Stubbs, S., Woodford Halse, Byfield, S.O.
Vokes, B., 11 Minorca Road, Weybridge.
Waring, R., Pontsarn, College Road, Ringwood, Hants.
Warr, M., Min Afon, Llanerchymor, Holywell, Flintshire.
Wayles, J., Ironstone Road, Chase Terrace, Walsall.
63. Audsley, H., Newtown, Kirkheaton.
Bennett, H., 4 Heaton Road, Canterbury.

Benson, C., Prospect House, Rayleigh, Essex.
Broumley, J., School House, Gainford, Darlington.
Buckle, C., Ivy Cottage, Hambrook Hill, Emsworth, Hants.
Cleveley, R., School House, Newbridge, Radnorshire.
Gibson, J., Birdville, High Road, Wealdstone, Middlesex.
Gittins, A., School House, Abergele, N. Wales.
Grounds, A., Ash Lea, Albert Road, Hale, Cheshire.
Harries, S. O., Upnor Cottage, Carr Avenue, Leiston, E. Suffolk.
Haughton, W., School House, High Legh, Knutsford.
Hayes, A., Publow School, Pensford, Bristol.
Holbrook, J., Llanporth, The Avenue, Chingford.
63. Lace, J., 33 Hawthorn Road, New Moston, Failsworth, Man.
Legerton, C., Glynndale, Garland Road, Parkeston, Harwich.
Luke, W., Dihewid Council School, Felinfach S. O., Cardiganshire.
Marle, H., Park Road House, Stapleton, Bristol.
Mew, P., The Cottage, Wainfleet, Lincs.
Nicholson, E., Town Green, Slaggyford, *via* Carlisle.
Quick, R., c/o Miss Gibbs, High Street, Keynsham.
Sellers, G., Gladmyr House, Fitzroy Street, Hull.
Thompson, E., 64 Wood Lane, Sankey, Warrington.
Turner, G., Woodfield Lodge, Dursley, Glos.
Woodford, P., Boys' School, South Cave, East Yorks.
Blakeman, A., Peel Avenue, Bowdon, Cheshire.
Blakeway, A., Winchester House, Kingston Hill, Norbiton.
Bowden, G., North Bersted, Bognor.
Brett, H., Berwyn, Tarvin Road, Vicars Cross, Chester.
Brown, F. Wycliffe, King's Road, Belmont, Sutton.
Cross, J., 109 Avenue Road, Itchen, near Southampton.
Fox, S., 38 Griffith Street, Rushden, Northants.
Guest, A., 5 Starbrick Road, Milford Haven, Pembrokeshire.
Hallworth, T., 9 Beech Terrace, Shirebrook, Notts.
Head, W., 158 Hartfield Road, Wimbledon.
Horler, E., 16 Garland Road, Ware, Herts.
87. Howells, F., 5 Priory Glen, Wakefield Road, Pontefract.
Lager, H., Devonshire Street, Ambergate, Derby.
Lister, M., Hagley House, Lugwardine, Hereford.
Moss, G., Orchard Villa, Bangor Isycoed, Wrexham.
Oldham, C., 210 Inverness Place, Roath Park, Cardiff.
Ralphs, F., North Kelsey, Lincoln.
Rogers, T., 127 Robertson Road, Eastville, Bristol.
Simpson, E., 12 Alexandra Road, Penn, Wolverhampton.
Starmer, T., Polesworth, Tamworth.
Tolerton, I., 10 Overndale Terrace, Downend, Bristol.
Watson, C., High Street, Bitterne, Southampton.
Williams, J., School House, Llansannan, Abergele.
110. Appleton, J., Illawarra, Park Road, Chelmsford.
Archer, F., Watling Street, Dordon, Tamworth.

110.
Beetlestone, J., Ashleigh Villa, Market Rasen.
Brain, L., Hill Crest, Glascote, Tamworth.
Buchan, A., Craig de Varne, Bradwall Road, Sandbach.
Chatterton, W., 124 Church Street, Ellesmere Port, Chester.
Clarke, H., 29 Graham Road, Worthing, Sussex.
Giles, R., School House, Petrockstowe, Dolton, Devon.
Halifax, F., 35 Sandford Avenue, Wood Green, N.
Mansell, W., 24 Leek Road, Smallthorne, Stoke-on-Trent.
Miles, C., 164 Dudley Street, Brierley Hill, Staffs.
Mills, R., 27 Arundel Road, Littlehampton, Sussex.
Munckton, L., 38 Calais Gate, Myatts Park, S.E.
Nicholls, W., School House, Braywood, Maidenhead.
Norton, F., School House, Northleach, Glos.
Quance, S., 13 Alexandra Road, Axminster.
Reed, T., Rockleigh, Downend, Bristol.
Richards, T., 45 Penrhiwceiber Rd., Penrhiwceiber, S. Wales.
Sharp, J., Oakland House, Holywell, Flintshire.
Shotton, T., Station View, Leadgate, Durham.
Strudwick, E., 6 Banstead Road, Belmont, Surrey.
Thorpe, F., Ophir, Brighton Road, Worthing.
Waight, R., 11 Beaconsfield Road, Bexhill-on-Sea.
Warren, W., Lovewell Road, Kirkley, Lowestoft South.
West, H., Poplar House, Enderby, Leicester.
Wilson, H., Essington School, Wolverhampton.

136.
Ashley, E., Ivy House, Quainton, Aylesbury.
Atkinson, F., Newton, Lesbury, Northumberland.
Barnham, W., 7 Ceres Road, Kingston, Surrey.
Bayley, E., 5 Alexandra Road, Sible Hedingham, Essex.
Bennett, J., All Saints' School, Cleveden, Somerset.
Dives, W., 13 Hythe Road, Cheadle Heath, Stockport.
Durrant, J., 25 The Acre, Pilsley, Chesterfield.
Farmer, G., 22 Croft Street, Tamworth.
Ford, T., Peel Lane, Little Hulton, Bolton, Lancs.
Grand, S., 13 Ladysmith Road, Cradley, Staffs.
Harden, W., Square Farm, Burwash, Sussex.
Huggins, J., 5 Granville Terrace, Wheatley Hill, Thornley, S.O.
Jamison, C., Park Villas, Rothwell, Leeds.
Kenwright, F., 109 Clock Face Road, Clock Face, St. Helen's.
Meeson, H., Abbeydore, nr. Hereford.
Moss, E., 75 The Common, Upper Clapton, London.
Parry, R., Church School, Llanbrynmair, Mont.
Pirie, J., c/o Mrs. Page, Boxted, Colchester.
Snow, A., 7 Manor Road, Waltham Abbey, Essex.
Southworth, J., 40 Hall Road, Crumpsall, Manchester.
Storey, A., 15 Somerset Road, Barry Dock.
Taylor, H., 29 Audley Street, Cockbrook, Ashton-under-Lyne.
Trevor, J., Wren's Nest, Meddin's Lane, Kinver, Stourbridge.
Wale, J., Whissendine School, Oakham, Rutland.

136. Weaver, J., Laughton, nr. Rotherham.
Wells, G., 2 The Holmes, Lydney, Glos.
Widgery, F., Myrtles, High Street, Portishead, Somerset.
Wood, S., 19 Dunn's Bank, Quarry Bank, Brierley Hill.

164. Bartlett, P., Lerryn, Lostwithiel, Cornwall.
Bennett, A., 35 Beaconsfield Road, St. George, Bristol.
Bowyer, J., East Boldre, Brockenhurst, Hants.
Bridgwater, H., Elsmere, 97 Sutton Road, Walsall.
Brooks, E., 3 Sea View Road, Shoeburyness.
Collins, J., Roseville, Greenside, Ryton-on-Tyne.
Davey, V., 6 Park Villas, High Road, Loughton, Essex.
Dove, A., School House, Denton, Grantham.
Ellwood, A., Mellis, Eye, Suffolk.
Flinders, F., 92 Solon Road, Brixton, S.W.
Hall, W., Ashgrove, South Elmsall, Yorks.
Hanford, E., 84 Eleanor Road, Waltham Cross.
Harris, W., St. Cyros, Luxulyan, Lostwithiel, Cornwall.
Jones, E., Tregroes Church School, Llandyssul, Cardiganshire.
Jones, E., Shamrock, Wellesley Road, Clacton-on-Sea.
Lansdell, C., 30 Smithfield Road, City Road, Norwich.
Lloyd, G., Vowchurch School, Hereford.
Matthews, A., Home for Little Boys, South Darenth, Kent.
Moore, F., 69 Desborough Avenue, High Wycombe.
Morrell, W., Swingfield School, Dover.
Mumby, A., Osgodby, Lincoln.
Pardy, A., Glenluce, Forteath Avenue, Elgin.
Parke, F., School House, Ramnoth Road, Wisbech.
Parker, E., 10 Lenham Terrace, Crayford, Kent.
Pearce, T., Doulting, Shepton Mallet.
Randall, J., School House, Cossall, Notts.
Smith, W., 1 Beaconsfield Road, The Honies, Bexhill-on-Sea.
Snell, E., Church School, N. Walsham, Norfolk.
Thomas, J., The Square, Beacon, Camborne.
Walker, J., School House, Cropton, Pickering, Yorks.
Watkinson, G., N. Anston, nr. Sheffield.
Wilson, A., School House, Barnaby Moor, Guisborough.
Worner, P., 9 Edgerton Park Road, Pennsylvania, Exeter.

197. Arnott, A., 38 Essex Road, Rushden, Northants.
Avis, D., Bitterley School, Ludlow, Salop.
Beagle, S., Road, *via* Bath.
Bickley, A., Headington Quarry School, Oxford.
Blackshaw, G., Whitwell, Mansfield.
Chamberlain, J., 56 Eastfield Road, Peterborough.
Clark, C., Funtley School, Fareham, Hants.
Davey, A., Faldingworth, Lincoln.
Dawton, H., School House, Baschurch, Salop.
Dearch, F., Church of England School, Stansted, Essex.
Dix, H., Smalley, Derby.

Evernden, F., Pelham, Benhill Avenue, Sutton.
Fennings, A., Morton, Brading, Isle of Wight.
Gage, B., Fernbank. Brinkworthy Road, Stapleton, Bristol.
Garner, J., School House, Great Wilbraham, Cambs.
Griffiths, D., Mona House, Coedpoeth, Wrexham.
Grimshaw, W., 17 Bardsley Terrace, Edge Lane, Droylsden, Manchester.
Hammond, E., 97 Moor Street, Brierley Hill, Staffs.
Hibbard, J., Thurston, Bury St. Edmunds.
Husband, A., Liskeard, Cornwall.
197. Jones, E., Council School, Menai Bridge.
Lilley, A., School House, Melbourne, Derbyshire.
Lucas, A., Tuxford House, Leverington, Wisbech.
Rolling, W., Cropstone, Leicester.
Rowe, R., Cardington, Church Stretton, Salop.
Sadler, H., Alpha, Rubery, Rednal, Birmingham.
Smith, M., Bitteswell, Lutterworth, Leicestershire.
Stevenson, W., High Hill, Essington, Wolverhampton.
Twigg, A., Talbot Street, Cradley, Staffs.
Udall, J., School House, Elmstead, Ashford, Kent.
Wicks, J., 16 Lower Ford Street, Coventry.
Alderton, G., 21 Station Grove, Wembly, N.W.
Allard, E., 111 Park Road, Plumstead, S.E.
Aveling, A., 49 North Parade, Grantham.
Bateman, W., 183 St. Luke's Road, Edgbaston.
Bowen, T., School House, Crasswall, Hereford.
Brain, H., Southleigh, Kingswood, Bristol.
Bramall, A., Weston Schools, Crewe.
Brown, F., The Poplars, Grange Road, Ryton-on-Tyne.
Bryant, Leonard, 15 Eaton Road, Fleetville, St. Albans.
Clare, F., Cressett Street, Brockmoor, Brierley Hill.
Clark, S., Gun Cottage, Heaton, Macclesfield.
Cole, W., High Street, Staple Hill, Bristol.
Dawson, F., Filkin's School, Lechlade, Glos.
228. Drake, M., Anerley, Brading, Isle of Wight.
Fearn, F., Chasetown, Walsall.
Griffiths, A., 47c Salop Street, Dudley, Worcestershire.
Harding, J., 17 Grosvenor Square, Lower Broughton, Manchester.
Harrison, J., 16 Acres Road, Bebington, Cheshire.
Harwood, H., 102 Nicolas Road, Chorlton-cum-Hardy, Manchester.
Hesketh, W., 173 Park Grove, Barnsley, Yorks.
Ing, W., 45 Aston Street, Oxford.
McMahon, M., Skippool Road, Poulton-le-Fylde, Lancs.
Milner, J., School House, Carlton Miniott, Thirsk.
Nicholson, H., 84 Silver Street, Newport Pagnell.
Osborne, F., Court Estate, Newton Road, Rushden.

Parsons, B., Old School House, Oakamoor, N. Staffs.
Phillips, J., 3. Railway Terrace, Coseley, Bilston.
Price, W., School House, Bala, N. Wales.
Rowlands, H., The Cottage, Llaniestyn, Pwllheli.
Russell, W., School House, King's Bromley, Lichfield, Staffs.
Slade, W., Dunlewey, Flaxley Lane, Stechford, Birmingham.
228. Stainton, J., 19 Gospel End, Sedgley, Dudley.
Stanbridge, J., 8 Harley Road, Harlesden, N.W.
Stanley, A., 62 Essex Street, Wallsall.
Tremlett, G., 3 Clare Avenue, Hoole, Chester.
Voisin, A., 55 Bostall Hill, Plumstead.
Wilson, P., School House, Warborough, Wallingford.
Askwith, M., 118 Gillott Road, Birmingham.
Bell, W., 37 Church Street, Beldon Colliery, Newcastle.
Byers, T., 68 Westwood Road, Leek, Staffs.
Cattanach, A., Ellesmere House, Rosemarket, Neyland, S. Wales.
Coffin, P., 5 Cobham Street, Gravesend.
Compton, S., The Retreat, Binegar, Bath.
Davies, C., 1 Victoria Terrace, Greenfield, Rhosddu, Wrexham.
Deakin, R., 112 Amington Road, Tamworth.
Hart, A., Ladylands, Shorwell, Newport, Isle of Wight.
Heath, E., 145 Victoria Street, Willeshall, Staffs.
Higham, C., Measham, Atherstone.
265. James, W., 39 Beaconsfield Road, Chatham.
Jefferies, H., Station Road, Ringwood, Hants.
Johnson, W., Manchester Road, Plumbley, Knutsford.
Jones, D., 79 St. John's Road, Dudley.
Nixon, A., Birdham, Chichester.
Pedley, E., Fern Royd, Elmton Road, Creswell, Mansfield.
Raybould, G., 26 Wellington Road, Dudley.
Riley, H., 11 Chaucer Road, Bath.
Sharpe, W., Brierley, nr. Barnsley, Yorks.
Shelley, H., School House, N. Stoneham, Eastleigh, Hants.
Wheaton, F., School House, Stockland, Honiton.
Whitaker, C., 141 Promenade Road, Fleetwood, Lancs.
Wild, F., Saxby Lodge, Gloster Road, Cheltenham.
Wintle, J., Parkend C. School, nr. Lydney, Glos.
Baker, H., Stock Hill, Stratton-on-Fosse, Bath.
Barnes, T., 15 Fairfield Avenue, Peverell, Plymouth.
Baskin, W., School House, High Halston, Rochester.
Brayshaw, T., Rawdon House, 152 Railway Street, Nelson.
290. Coates, R., 9 High Street, Bruton, Somerset.
Dale, W., Wistaston, Rodbourne Grange, Swindon.
Elcock, E., 12 Bridge Road, Kirkstall, Leeds.
Haden, A., Bridle Road, Wollaston, Stourbridge.
Harris, G., Clynmawr Farm, Cwmtylery, Mon.
Haywood, A., Kirmond-le-Mire, Market Rasen, Lincs.

Holmes, A., Council School, South Kelsey, Lincoln.
Hudson, W., 11 Aylesford Road, Handsworth, Birmingham.
Jackson, J., Surdoles, Hillam, South Milford, Yorks.
Jackson, W., 86 West Hill, Hednesford, Staffs.
Jarman, B., 64 Broniestyn Terrace, Aberdare.
Kaye, P., School House, Clayton, Bradford.
Kirby, W., High Street, Collyweston, Stamford.
Lilley, A., School House, Stone, Aylesbury.
290. May, F., Field Lane Boys' School, Hillfield Road, West Hampstead.
Palmer, G., 28 St. John's Road, Whittington Moor, Chesterfield.
Pengelly, W., 1 Dale Road, Rawmarsh, Rotherham.
Rogers, A., School House, Penkridge, Stafford.
Rowlands, E., Tegfryn, Chwilog, Carnarvon.
Smith, F., 4 Cricklade Road, Upper Stratton, Swindon.
Todd, C., 389 London Road, South Lowestoft.
Vardon, P., School House, Staverton, Cheltenham.
Worthington, E., 6 Guildford Road, Canterbury.
Bond, O., Ashdale, Oulton Broad, Lowestoft.
Bratherton, T., 19 Woodford Road, Watford, Herts.
Cason, J., Upwell Council School, Wisbech.
Cresswell, F., High Street, Thornbury, Glos.
Dent, G., 17 Vicarage Road, Wednesbury, Staffs.
Essex, A., School House, Hurstbourne Priors, Whitchurch, Hants.
Fawcett, G., 24 Doveleys Rd., Irlams-o'-th'-Height, Manchester.
Gray, J., Woodside House, Ryton-on-Tyne, Durham.
Green, G., Cornwood, South Devon.
Gunnell, J., 192 Alexander Road, Acocks Green, Birmingham.
Hardy, E., Winston, Darlington.
Harris, J., Weir Marsh, High Bickington, Chulmleigh, Devon.
Jackson, T., 24 Market Street, Heanor, Derbyshire.
Jones, H., Pulford School, Leighton Buzzard.
317. Lack, A., School House, Bozeat, Northants.
Marsden, J., 184 Great Western Street, Moss Side, Manchester.
Milnes, O., School House, Bowers Allerton, Woodlesford, Leeds.
Needham, R., Coneyhurst Farm, Ewhurst, Guildford.
Nicholls, W., North Road, Midsomer Norton, Bath.
Odhams, C., Sarratt School, Rickmansworth.
Owen, E., School House, Nocton, Lincoln.
Palmer, G., Rock House, Broad Street, Staple Hill, Bristol.
Papworth, L., 15 Station Road, Teddington.
Pickles, F., South View, Grewelthorpe, Ripon.
Scales, M., Bailiffe Bridge, Brighouse, Yorks.
Spence, J., Wesley House, Old Goole, Yorks.
Steventon, R., Woodside, Wem, Salop.
Swallow, H., Knaphill, Woking.
Wadlow, H., School House, Frenchay, Bristol.

317.
Warboys, F., 10 Grange Road, Bishop's Stortford.
Weyer, W., Park View, Fence Avenue, Macclesfield.
Williams, J., Post Office, Tanyfron, Wrexham.
Wood, J., Rounds C.E. School, Northants.

350.
Allen, Jos., 82 Portland Road, Rushden, Northants.
Barrett, P., School House, Desborough, Market Harboro'.
Bayley, S., Norden House, Norden, Rochdale.
Burch, C., Alpine Cottage, Hook Norton, Banbury.
Chatters, W., Council Schools, Exning, Newmarket.
Farrants, M., 54 Myrtle Road, Clapham Common.
Jennings, R., 18 Woodlands Road, Harrow.
Gibbons, A., Plemont, Norman Road, Cheam.
Griffiths, T., Llanddeusant Council School, Llangatock S.O., Carmarthenshire.
Hirst, W., North Eastern Road, Thorne, Doncaster.
Hobart, J., 42 Halifax Road, Batley, Yorks.
Hordern, S., Lyon Terrace, Rocester, Staffs.
Howells, S., Dyfeilog, Taff Street, Treherbert, Glam.
Hurdle, V., Highland Terrace, Whiteshill, Stroud, Glos.
Jones, D., 227 Oundle Road, Peterborough.
Jones, T., Gyffin C. School, Conway, N. Wales.
Kenyon, J., 208 Crow Lane West, Earlstown, Lancs.
Luff, E., Woodbury House, Axminster, Devon.
Needham, E., Coneyhurst Farm, Ewhurst, Guildford.
Norton, A., 138 High Street, Tewkesbury.
Nyilassy, W., Holymoorside, Chesterfield.
Ogden, E., Sandforth Road, West Derby, Liverpool.
Pugmire, H., 95 Elm Vale, Fairfield, Liverpool.
Reynolds, H., 12 Anglesey Villas, Crewe Road, Willaston, Nantwich.
Sanderson, G., Foxglove Avenue, Roundhay, Leeds.
Skinner, T., Mabelhurst, Milner Road, Merton, S.W.
Smallshaw, W., Woodhouse, Uplyme, Lyme Regis.
Summerhayes, J., Charing Heath, Ashford, Kent.
Toll, J., Falstone, Northumberland.
Van Linschooten, H., 4 Nightingale Road, Dover.
Viggars, O., School House, Horley, Banbury.
Wasdell, W., Auto Cottage, Brindley Ford, Stoke-on-Trent.
Whitby, J., 24 Spencers Road, Maidenhead.
Whittaker, J., 26 Pargeter Road, Warley, Birmingham.
Widdowson, A., Church Street, Greasborough, Rotherham.
Withyman, J., School House, Cherry Burton, Beverley.
Wright, R., Haughton End. School, West Drayton, Retford, Notts.

387.
Ash, O., Ingleside, Higham Ferrers, Northants.
Atkins, K., C.E. School, Raunds, Wellingborough.
Bailey, C., 5 Havelock Road, Great Yarmouth, Norfolk.
Brown, D., Dunbar, St. Luke's Terrace, Brighton.

Bullock, A., Rosemary Cottage, Keele Road, Newcastle, Staffs.
Burkett, A., 11 Robinson Street, Blackhill, Co. Durham.
Campbell, J., 110 Belgrave Road, Wanstead, Essex.
Carter, G., Fairfield, Short Heath, Wolverhampton.
Colwell, A., High Arcol House, The Straits, Lower Gornal, Dudley.
Davis, S., 13 Bellemoor Road, Southampton.
Dedman, J., School House, Marchwood, Southampton.
Denney, J., Silverstone, Towcester.
Garner, F., Endowed School, Warboys, Huntingdon.
Hart, G., 12 Brunswick Road, Shoreham-by-Sea, Sussex.
Heathcote, W., Cemetery House, Audenshaw, Manchester.
Hollis, C., Terrington St. Clement, King's Lynn.
Hough, R., 3 Margaretting Road, Manor Park, E.
387. Le Huray, C., 31 Emery Street, Cambridge.
Martin, E., C. of E. School, Raunds, Wellingborough.
Mawson, W., 83 Whitestile Road, Brentford, Middlesex.
Napthine, L., 6 Regent Street, Stowmarket, Suffolk.
Picken, C., Wakefield House, Burbage, Hinckley.
Pimm, C., The Laurels, Farrington Gurney, Bristol.
Pitfield, F., North Street, Downend, Bristol.
Sherratt, C., Strathmore, Lilleshall Street, Longton, Stoke-on-Trent.
Smith, M., The School, Debach, Woodbridge.
Smith, A., School House, Potterspury, Stony Stratford.
Streeter, T., 3 Orchard Road, Sutton, Surrey.
Turner, J., North Searle, Newark.
Turner, A., 153 Two Mile Hill Road, Kingswood, Bristol.
Waite, R., Vale House, Bassenthwaite, Keswick.

Best, A., 5 Fleece Road, Balaclava Road, Surbiton.
Brett, F., 88 Park Street, Thame, Oxon.
Burdett, H., Brampton Ash, Market Harboro'.
Burn, H., 8 Marine Approach, South Shields.
Chappell, Leonard, 50 Park Grove, Barnsley.
D'Alton, M., Holly Cottage, Barkston Ash, Tadcaster.
Gilbert, G., 22 Lincoln Road, Dorking.
Golds, A., Rosedene, Rayne Road, Braintree, Essex.
Holland, J., School House, Alderley, Crewe.
418. Hyde, C., The Rookery, Pye Bridge, Alfreton.
Jones, W., 3 Talybraich Terrace, Newborough, Anglesey.
Kinvig, J., School House, Ascot-under-Wychwood, Oxford.
Lambert, G., Fairhaven, Brightlingsea, Essex.
Lodge, W., 17 Goldsmith Road, Friern Barnet, New Southgate, N.
McDougall, A., School House, Portcharlotte, Islay, Scotland.
Naylor, J., 22 Willoughby Road, Green Lanes, Hornsey.
Pollard, G., Aynho, Banbury.
Rees, H., Roselands, Shustoke, Birmingham.

Rose, W., 39 Park Lane, Chippenham, Wilts.
Saunders, A., 10 Walpole Street, Whitmore Reans, Wolverhampton.
Simcox, H., 33 Scarborough Street, Irthlingborough, Wellingborough.
418. Swallow, H., Farnley Hall Farm, Farnley, Leeds.
Thompson, P., Station Road, Polesworth, Tamworth.
Trew, H., 22 Oldfield Road, Bath.
Vere, A., 2 Vicarage Lane, East Ham.
Whybray, W., London Street, Godmanchester, Huntingdon.
Wilson, W., 6 Eldon Terrace, Ferryhill Station, Co. Durham.
Wittrick, H., 17 St. Philip's Road, Norwich.

Allen, E., Spring Hill, Wilby, Wellingborough.
Bailey, H., 1 Harrison Road, Brettell Lane, Stourbridge.
Bannister, M., 16 Windsor Road, Ramsey, Isle of Man.
Barrow, J., Schoolhouse, Morland, Penrith.
Bechervaise, A., 19 Park Road, Staple Hill, Bristol.
Carter, M., C. of E. School, Raunds, Wellingborough.
Chapman, W., School House, Burley Gate, Hereford.
Chapman, H., Dolfos School, Newtown, N. Wales.
Cowell, W., 58 Lynton Road South, Gravesend.
Dale, F., 57 Chester Road, Audley, Staffs.
Davies, G., Pendennis Farm, Downend, Bristol.
Dewhurst, A., 148 Platt Lane, Rushholme, Manchester.
Fearn, W., 38 Langwill Road, Shirebrook, Mansfield.
Fieldhouse, H., Bowers, Standon Bridge, Eccleshall, Staffs.
Gillard, W., Normanhurst, Kidlington, Oxon.
Hattam, H., 10 Hollyhedge Terrace, College Park, Lewisham.
Holt, G., 154 Tempest Road, Beeston Hill, Leeds.
446. Howard, W., 7 Springhead Road, Northfleet, Kent.
Jackson, H., Stoke Golding, Nuneaton.
Jefkins, H., Walpole, Halesworth, E. Suffolk.
Loose, A., Sunny Bank, Prestbury, Macclesfield.
Lucas, E., 25 Alsager Road, Audley, Newcastle, Staffs.
Mepham, W., 6 South Park Crescent, Ilford.
Morris, A., Tittleshall School, Swaffham, Norfolk.
Price, W., 25 Sheffield Road, Creswell, Mansfield, Notts.
Sampson, B., The Gables, Shelley, Huddersfield.
Sayer, G., Lodge Lane, Old Catton, Norwich.
Searle, J., C. of E. Schools, Wooton Bassett, Swindon.
Spencer, R., 142 Windleshaw Road, St. Helen's, Lancs.
Stafford, T., 125 Palmerston Road, Peterborough.
Steele, Jas., School House, Nether Whitacre, Birmingham.
Taylor, F., 4 Chase Green, Enfield, N.
Thomas, H., 1 Navigation Villas, Miskin, Mountain Ash.
Thompson, J., School House, Measham, Atherstone.
Walker, F. Ross-, School House, Cropredy, Leamington.
Watson, T., School House, Longford, Derby.

446. Watson, J., West Butterwick, Doncaster.
Wilkinson, J., 72 Barnsley Road, Goldthorpe, *via* Rotherham.
Williams, J., 11 Aynscomb End, High Street, Orpington, Kent.
Williams, R., Llanddeinwlen School, Carnarvon, N. Wales.

486. Banks, H., 33 Buller Street, Derby.
Basnett, J., 21 Bank Street, Cheadle, Staffs.
Brown, W., Selling School, Faversham, Kent.
Davies, W., 115 Station Road, Old Hill, Staffs.
Davies, S. Garth View, Taffs Well, Cardiff.
Foote, S., Hill View, Kendrick Street, Wednesbury.
Goldspink, C., 155 Thorpe Road, Melton Mowbray.
Gribble, H., 195 Mill Road, Wellingborough.
Griffiths, W., 39 Himley Road, Gornal Wood, Dudley.
Ham, W., Clifford House, Tiptree, Essex.
Hampson, W., 308 Central Park Road, East Ham.
Harvey, H., School House, Blundeston, Lowestoft.
Hill, W., Rosenborg, Wodeland Road, Guildford.
Hull, W., School House, South Brent, South Devon.
Jackson, W., 12 Eckington Road, Beighton, Sheffield.
Jones, D., Llwydcoed P.O., Aberdare, S. Wales.
Lythall, F., 24 Harrow Road, Narboro Road, Leicester.
Miles, B., School House, Castle Gate, Grantham.
Peacock, E., Earls Barton, Northampton.
Pickup, G., 52 Woodbrook, Lees, Oldham.
Rattan, G., 12 Beaconsfield Terrace, Rushden, Northants.
Rockliff, F., 205 Claremont Road, Halifax.
Sanders, F., 44 St. Matthias Road, Nottingham.
Thomas, E., Hopton School, Cam., Dursley, Glos.
Turner, F., 65 Balmoral Road, Gillingham, Kent.
Walling, P., School House, Wicken, Soham, Cambs.

512. Bailey, B., Laughton, Rotherham.
Bridgman, A., 1 Albert Road, Evesham, Worcestershire.
Burch, A., Barcaldine, Oakdale Road, Weybridge.
Carter, W., School House, Flimwell, Hawkhurst, E. Sussex.
Chandler, A., School House, N. Clifton, Newark.
Cox, J., 35 Paget Road, Wolverhampton.
Dickinson, R., 5½ Meadow Terrace, New Herrington, Fencehouses, Durham.
Gomme, G., School House, Harbledown, Canterbury.
Goy, H., 16 Castle Causeway, Sleaford, Lincs.
Grashion, W., South View, Smalley Common, West Hallam.
Grayshon, L., Winterbourne Abbas, Dorchester.
Heath, T., 45 Alexandra Road, Longton, Stoke-on-Trent.
Hiscock, S., School House, Shalford, Braintree, Essex.
Hooper, C., Preston Road, Yeovil, Somerset.
Jones, D., Llandulas, Llangyli, Cardiganshire.
Lee, J., School House, Barrow, Gurney, Bristol.
Maunder, C., Belvedere, Seldown, Poole, Dorset.

Middleton, J., Hutton Bussell, West Ayton, Yorks.
Murray, F., School House, Brushford, Dulverton, Somerset.
Packer, R., 281 Wellingboro Road, Rushden, Northants.
Palmer, J., Morton School, Bourne, Lincs.
Phennah, W., Y Ddol, Bersham, Wrexham.
Ridgewell, G., Heathdene, Heron Hill, Belvedere, Kent.
Rolfe, S., Council School, Ashingdon, Rochford, Essex.
Saywell, L., Denton, Grantham.
512. Scott, E., 6 Queen's Road, Salisbury.
Smith, B., 11 Broomfield Road, Headingley, Leeds.
Summerhayes, F., 2 Summer Hill, Frome, Somerset.
Watkins, F., Westholme, Kessingland, Lowestoft.
Webb, A., 2 Church Street, Woodford-Halse, Byfield, S.O.
Whitehouse, W., Essington House, Darlaston, S. Staffs.
Wigglesworth, W., School House, Waddington, Clitheroe.
Williams, I., Cynlais Villas, Ystradgynlais, Breconshire.
Williams, S., Boskenwyn School, Helston, Cornwall.

Alen, L., 3 Approach Road, Broadstairs, Kent.
Alexander, W., School House, Toft Monks, Beccles.
Barnfield, A., Instow, Greenford Road, Sutton, Surrey.
Biles, W., Beachy Head, Nutley, Uckfield.
Bodey, E., Rockley Place, Kingswood, Bristol.
Bradden, J., School House, Butleigh, Glastonbury.
Brown, F., 184 New Road, Chatham.
Brown, C., 1 St. George's Terrace, Westoe, South Shields.
Bulled, W., 23 East Street, South Molton.
Bursnall, J., 98 Cleveland Terrace, Burnley.
Chamberlain, R., Council School, Kirton Holme, Boston, Lincs.
Coldicott, A., School House, Toddington, Winchcombe, Glos.
Deering, W., 23 Barrington Street, Tiverton, Devon.
Garrett, J., Sundon Schools, Dunstable, Beds.
546. Green, H., Sutton Bridge, Wisbech.
Hill, J., 63 Margaret Road, Whitley Bay, Northumberland.
Hogg, R., King Street, Creswell, Mansfield.
Kellar, F., Westleigh, Pensnett, Dudley.
Lee, D., 24 Whitehall Terrace, Hylton Road, Sunderland.
Lewis, W., Church Elm Lane, Dagenham, Essex.
Murfitt, B., 5A Sedgemere Avenue, E. Finchley, N.
Parker, A., Mayfield, Ripponden, Halifax.
Perry, I., Bevondene, Avenue Road, Belmont, Surrey.
Peters, H., School House, Wardington, Banbury, Oxon.
Piper, H., Wilmcote, Stratford-on-Avon.
Robinson, K., 11 Carnarvon Street, Hollinwood, Oldham.
Scutt, T., School House, Milton Abbas, Blandford, Dorset.
Sheppard, W., Upper Road, Clutton, Bristol.
Smailes, J., 23 Lorne Street, Haltwhistle, Northumberland.
Smart, W., Well House, Bempton, Bridlington.
Smith, E., 60 Sunbury Street, St. Helen's, Lancs.

Summerson, D., Tillmouth School, Cornhill-on-Tweed.
546. Towle, W., Ashley Road, Louth, Lincolnshire.
Ward, B., Ivy Lea, Knoclaid Road, Clubmoor, Liverpool.
Young, J., School House, Holbrook, Ipswich.
Barcham, C., School House, Netheravon, Salisbury.
Barker, J., 24 Wedgwood Street, Smallthorne, Stoke-on-Trent.
Barker, C., School House, Chute, Andover, Hants.
Bullock, H., Park Head Farm, Causey Row, Martley Hill, Swalwell, S.O., Co. Durham.
Butler, E., The School, Charlton Mackull, Somerset.
Coombes, G. J., Aldsworth, Northleach, Glos.
Fish, R., 3 Wesley Villas, Frome, Somerset.
Foizey, W., Coombe, Woodstock, Oxon.
Garrett, A., School House, Chicheley, Newport Pagnell.
Green, C., 4 Portland Street, Leek, Staffs.
James, T., The Cottage, West Down, Devon.
581. Jones, R. H., School House, Marlborough, Kingsbridge.
Longbottom, F., 20 Borrowdale Road, Lancaster.
Markham, G., School House, Peterstow, Ross, Herefordshire.
Mason, J., Bentley Mill, Bentley, Doncaster.
Mathews, F., Rose Cottage, W. Buckland, Wellington, Somerset.
Moore, W., School House, Welford, Rugby.
Phillips E., 82 London Road, Stony Stratford, Bucks.
Pritchett, A., 6 Hop Gardens, Henley-on-Thames.
Puxley, A., School House, Norton, Subcourse, Norwich.
Schofield, J., 25 King Street, Desborough, Market Harborough.
Skidmore, H., School House, Warmington, Oundle.
Smith, C., 20 Holmer Road, Hereford.
Stephenson, E., 94 Central Drive, Shirebrook, Mansfield.
Wescombe, W., Wraxall, Nailsea, Bristol.
Burrell, G., Lingerfield, Knaresborough.
Burton, J., 26 Radstock Road, Midsomer Norton, Bath.
Cooke, W., School House, Goosnargh, Preston, Lancashire.
Cox, G., School House, Chewton Mendip, Bath.
Edwards L., c/o Mrs. Childs, 2 Chesham Road, Guildford.
Matthews, H., Westfield, West Street, Haslemere.
Nutton, H., 199 Claremont Road, Halifax, Yorks.
Palmer, J., Calton House, Greasborough, Rotherham.
Parratt, J., North Walls, Melsetler, Orkney.
606. Pilot, J., 8 Hall Street, Welshpool, Mon.
Radley, M., School House, Dunchideock, Exeter.
Rowe, W., 37 Wisbech Road, King's Lynn.
Ryle, W., 52 Garden Road, Prestwich, Manchester.
Shelton, J., Council School, Haxby, York.
Shuttleworth, A., 81 Wordsworth Street, Sefton Park, Liverpool.
Stevens, G., Rose Cottage, Wetherden, Stowmarket.
Thomas, F., Hopton School, Cam, Dursley, Glos.
Willdig, W., Ash Tree Road, Pelsall, Walsall.
Williams, W., School House, Dinorwig, Cwmyglo, Carnarvon.

Aspden, J., 167 Cribden View, Rawtenstall, Manchester.
Barker, F., School House, Tolleshunt Major, Witham, Essex.
Boyden, C., 64 Atbara Road, Teddington.
Colyer, F., 1 Clive Road, Belvedere, Kent.
Cosham, H., Kent Coast College, Herne Bay.
Davies, M., Llangybi School, Chwilog, S.O., Carnarvonshire.
Day, S., Arcadia, Sizewell Road, Leiston, Suffolk.
Dobson, A., The Spa, Tewkesbury.
Evans, H., 41 Chantrey Road, Woodseats, Sheffield.
Fenton, G., Boys' C. School, Soham, Cambs.
Francis, C., Froyle, Peppard, Henley-on-Thames.
Haggan, R., 238 St. Thomas Road, Derby.
Hales, H., c/o Mr. H. Perkins, 26 Wellingboro Road, Rushden.
Harris, C., Rosewood Cottage, Mereworth, Maidstone.
625. Hughes, E., 8 Ripon Cottages, Shaw Road, Bushbury, Wolverhampton.
Huntley, J., 6 Princess Street, Stockton Road, Sunderland.
Hyland, E., Sackville Croft, Ewhurst, Sussex.
Kitchen, F., Laughton, Rotherham.
Large, E., Hill Top, Oughtibridge, Sheffield.
Pearn, W., 9 Egerton Park Road, Pennsylvania, Exeter.
Shepherd, A. L., Kinver School House, Stourbridge.
Shield, F., New House, Peases West, Crook R.S.O., Co. Durham.
Strong, W., Broad Street, Somerton, Somerset.
Taylor, G., School House, New Leake, Boston.
Vorley, C., Raunds C. E. School, Raunds, Wellingborough.
Warne, P., 71 Albert Street, Shildon, Co. Durham.

Brayley, F. H. W., Croft House, Scholes, Thongsbridge, Huddersfield.
Broad, W., Lewannick, Launceston, Cornwall.
Calvert, J. B., 59 Woodland Terrace, Darlington.
Chapman, F. W., 31 Lochaber Street, Roath Park, Cardiff.
Clarke, Miss F. H., Litton, near Bath.
Cooper, Miss J. L., 21 Connaught Street, W.
Davies, Fred, Brook Mount, Acrefair, Ruabon.
Dring, Florence, 59 Higham Road, Rushden, Northants.
Gardam, Henry, 25 Colne Road, Barnoldswick, *via* Colne.
651. Hancock, J. H., Stratton School, Cirencester.
Heyworth, James, 5 Hunter Street, Brierfield, Lancs.
Hinchcliffe, J. A., 10 Clerk Green Street, Batley, Yorks.
Jeffery, Chas. R., Marden Road, Staplehurst, Kent.
Johnson, George H., Eversley House, Brooke, Norwich.
Knight, Matthew, 46 Springfield Road, Moseley, Birmingham.
Longdon, Alfred, Lynn Croft, Eastwood, Notts.
Maskell, G. T. G., Evergreen Villa, York Road, Waltham Cross.
Owen, J. M., 2 Primrose Avenue, Crewe Green, Crewe.
Parsons, H. E., Church Lane, Drayton, near Abingdon, Berks.

Robinson, J. E. W., 11 Wood Cross, Deepfields, near Bilston.
Slee, A. H., School House, Mortehoe, N. Devon.
651. Walker, Felix M., Strad House, Wisbech.
Watts, A., 50 Falcon Road, Ponders End, Enfield.
West, A. E., 24 Harley Wood View, Todmorden, W. Yorks.
Yeoman, W. G., 21 John Street, New Skelton, Cleveland.
Armstrong, R., Tatnamona National School, Maguiresbridge, Co. Fermanagh.
Blum, S. J., 44 Apedale Road, Chesterton, Staffs.
Brown, D., Barne, Beer Alston R.S.O., Devon.
Burns, R., Conservative Club, Ambleside, Westmorland.
Chapman, H., Ramsden School, Charlbury, Oxon.
Davies, E., Bryntirion, Rhiwlas, Bangor, N. Wales.
Duckett, J. E., 64 Cow Close Road, Lower Wortley, Leeds.
Durrant, T., Gladstone Villas, Pilsley, Chesterfield.
Gidney, H. T., Evergreen Villa, York Road, Waltham Cross.
Griffith, G. D., School House, Warmley, near Bristol.
Hemingway, F., 26 Deri Road, Penylan, Cardiff.
Hillier, L. R., The Cosy, Edge End Road, Broadstairs, Kent.
Hurley, R. J., School House, Dunkerton, Bath.
676. Jones, J. E., The County School, Bethesda, N. Wales.
Kroeger, M. C. A. C., 2 Conan Mansions, West Kensington, W.
MacGeorge, D., 83 Kingsway, Mortlake, Surrey.
Matthews, H., 120 Wellington Road S., Hounslow.
Mawson, A. W., East Stockwith, Gainsborough.
Owens, M., Glan-yr-eryr, near Farmers, Llanwrda, Carmarthenshire.
Pye, P. J., c/o Mrs. Southgate, Elmham S. O., Norfolk.
Rhys, D., British School House, Peterchurch, Hereford.
Robinson, T. A., Werrington, Stoke-on-Trent.
Rogers, J. E., Highfield, Broughton, Wrexham.
Smythem, G. F., 50 Park Road, Rushden R.S.O., Northants.
Thomas, I. W., 15 Moreton Road, Holyhead.
Weaver, G. A., 18 Croft House Lane, Marsh, Huddersfield.
Williams, S. H., 124 Church Street, Ellesmere Port, near Chester.

Class III.

Anthony, G. H., 46 Rugby Street, Wolverhampton.
Beaumont, J. T., 25 Colne Road, Barnoldswick, *via* Colne.
Bewick, J., Nelson House, New Seaham, Durham.
Bosworth, G., Occold, Eye, Suffolk.
Colclough, J., 17 Stone Road, Longton, Staffs.
1. Cottrell, M., Breaston Road, Risley, near Derby.
Davies, E., Frankfort, Queen's Road, Egham.
Dickinson, S., St. Albans Road, Arnold, Notts.
Dodds, W., The School House, Blaydon-on-Tyne, Durham.
Donell, F., 30 Duke Street, Boston, Lincs.

1.
Downend, J. M., Blyth House, Wombwell, Yorks.
Fenny, J. H., 39 Albert Street, Shildon, Co. Durham.
Gowar, J. S., Restland, Kingshill, Nailsea, Bristol.
Hardman, G., Church Road, Thornton, Preston.
Hensman, W. H., 115 Oak Lane, West Bromwich.
Jefferson, S. C., 3 Howard Road, Dorking.
Johnson, G., 74 Sampson Road, Sparkbrook, Birmingham.
Morrell, A. H., 13 Farcroft Avenue, Handsworth, Birmingham.
Nutter, J. E., 2 Victoria Terrace, Burcott Road, Wells.
Paynter, G. A., 5 Cobham Street, Gravesend.
Roberts, R. H., 26 Storforth Lane, Hasland, Chesterfield.
Short, H. P., The School, E. Woodlands, Frome, Somerset.
Smith, A. E., Poplar Cottage, Boulge, Woodbridge.
Ward, R., 33 Midland Road, Olney, Bucks.
Williams, R. C., Council School, Rhiwlas, near Bangor, N. Wales.

26.
Ball, R. E., Prospect Place, Measham, Atherstone.
Burnham, W., 2 Coronation Crescent, Monkseaton, Northumberland.
Capps, H., School House, Guston, Dover.
Clayton, C. F., 9 Ashley Lane, Killamarsh, Sheffield.
Clifford, W. J., Plâs, Llanelian, Colwyn Bay, N. Wales.
Cranmer, G. P., Kent Coast College, Herne Bay, Kent.
Dennis, G., Millbrook, Rugeley Road, Chase Terrace, near Walsall.
Garrett, J. N., 50 Park Road, Rushden, Northants.
Hesmondhalgh, H. N., Woodplumpton C. E. School, Preston.
Jones, D. J., 1A Berestede Road, Hammersmith, W.
Jones, J., 6 Cilfodan Terrace, Bethesda, N. Wales.
Jones, W. T., 119 Gordon Road, Gillingham S.O., Kent.
Mockett, T. H., 1 St. Peter's Street, Chorley, Lancs.
Pearson, J. B., Moss Lane, Broadbottom, near Manchester.
Roberts, R. H., Byron House, Penygroes S.O., Carnarvonshire.
Rudling, F. H., Cromwell Avenue, Cheshunt, Herts.
Samson, G. A., 32 Credon Road, Plaistow, Essex.
Shaw, E. E., Crossfield Villa, Littleton, Chester.
Smith, W. J. W., High Street, Malpas, Cheshire.
Tootal, A., 74 Offerton Lane, Stockport.

46.
Burnett, S. T., 17 Lynton Avenue, W. Ealing, W.
Cathcart, A., Albert Memorial School, Corporation Road, Birkenhead.
Collins, J., Northwick School, Pilning, Bristol.
Cooter, E. K., Compton School, Petersfield.
Cope, J. H., 40 Ashburnham Road, Southend-on-Sea.
Dymond, L. H., Fair View, Dartmouth, S. Devon.
Fowler, S. F., 89 Horsecroft Road, Boxmoor, Herts.
Handley, J. L., Hawkshead, near Ambleside.
Lambert, R. M., 36 Hall Lane, Hindley, near Wigan.

46. MacGowan, E. R. G., Farm School, Redhill, Surrey.
Moore, G., 100 Belgrave Road, Oldham, Lancs.
Short, G. A. W., 5 Teville Road, Worthing, Sussex.
Stembridge, R., Osnaburg House, Linton, Cambs.
Upshall, W. C., School House, Titchfield, Fareham, Hants.
Wright, H. W., Springfield Terrace, Woodside, Horsforth.

61. Bosworth, A., 124 Church Street, Ellesmere Port, Cheshire.
Butterwick, S., Netherton House, Regent Street, Hetton Downs, Co. Durham.
Cole, A. B., 48 Warwick Road, Banbury.
Colyer, H. W., Sharnthwaite, Crosthwaite, near Kendal.
Crane, J. W., 98 Melton Road, Wellingborough.
Cresswell, L. M., 5 Tong Norton, Shifnal, Salop.
Cross, C., School House, Denmead, Cosham, Hants.
Geater, E. E., Stratford, S. Andrew, Saxmundham, Suffolk.
George, E. M., C. of E. School, Raunds, near Wellingborough.
Hadwin, T. R., 82 Durlston Road, Kingston-on-Thames.
Hill, H. A., 23 Prospect Avenue, Strood, Rochester, Kent.
Lambert, B. A., 23 Vicarage Street, Walsall, Staffs.
Lord, A. M., 103 Morley Avenue, Mapperley, Nottingham.
Morgan, W. P., 1 Homeleigh Villas, Coventry Road, S. Yardley, Birmingham.
Naylor, J. W., The School House, Lingen, Brampton Brian, Herefordshire.
Seals, B. W., 5 York Road, Wisbech, Cambs.
Smith, F., 26 County Road, Swindon, Wilts.
Wallett, T., 12 Beckett Street, Bilston.
Woodington, H. J., Myrtle Villa, Clouds Hill Road, St. George, Bristol.

80. Armstrong, W., 21 Meldon Terrace, Westoe, South Shields.
Barrett, W., Broxham Villa, Church Road, Hadleigh, Essex.
Carrington, W., Lorne Villas, Thurnscoe, Rotherham.
Gill, F. G., Industrial School, Desford, Leicester.
Kirby, G. H., 19 Bede Burn Road, Jarrow-on-Tyne.
Noble, G. B., 5 St. Paul's Terrace, Ryhope, Sunderland.
Packer, W. G., 53 Beaufort Road, St. George, Bristol.
Parker, L., Clifton, Downside, Belmont, Surrey.
Senton, R. M., 21 Violet Hill Road, Stowmarket.
Walker, W., 7 Airebank Terrace, Gargrave, *via* Leeds.
Whittaker, E. L., Orchard Road, Street, Somerset.

91. Benney, W. E., Carrabone, Mawgan, Helston, Cornwall.
Berry, A., c/o W. Sadler, Cleveland House, Richmond, Yorks.
Bill, F. W. C., Stiperstones, Minsterley, Salop.
Bishop, E., 8 Ashburnham Road, Tonbridge, Kent.
Bradfield, E., Claremont, Monmouth Street, Bridgwater.
Cooper, N., 45 Borneo Street, Walsall, Staffs.
Culling, M., School House, Canford, Wimborne.
Fry, E. W., School House, Longborough, Moreton-in-Marsh.

Joll, W., Downgate, Stoke Climsland, Callington, Cornwall.
Jones, T. Ll., 4 Moss Terrace, Winnington Park, Northwich.
Kerby, W. G., 38 Ince Avenue, Anfield, Liverpool.
Luke, J. H., Station Road, Somerton, Somerset.
91. Read, H. S., Staplecross, Hawkhurst, Sussex.
Sayer, C. W., Rose Villa, Upper Cam, Dursley, Glos.
Speakman, C., Council School, Marsh Lane, Chesterfield.
Willetts, T. J., 96 Grant Street, Edgbaston, Birmingham.
Williams, E., 19 Ridley Road, Harlesden, N.W.
Ainscough, A., 351 Derby Street, Bolton, Lancs.
Bullock, D. A., The School, Stonham Aspal, Stowmarket, Suffolk.
Caton, C. E., 14 School Lane, Heaton Chapel, Stockport.
Ewbank, T., Pen-y-Bryn, Cadoxton Barry, Glamorgan.
Hill, L. M., School House, Norwell, near Newark.
Isaacson, H., 208 Cromwell Road, Peterborough.
108. Latter, P. R., Stoke Row School House, Henley-on-Thames.
Lisle, J. R., Robson's Villas, Plessey Terrace, Blyth, Northumberland.
Mallett, N. S. G., Lerryn, Lostwithiel.
Phipps, Percy L. S., 12 Rupert Place, Northfield End, Henley-on-Thames.
Porteus, T. W., 36 Oxford Avenue, South Shields, Durham.
Williams, E. R., 5 Pen-y-Bryn Terrace, Blaenau Festiniog.
Bale, J., High Street Schools, Wealdstone, Middlesex.
Barrett, E. J., Spring Bank, Spring Hall Lane, Halifax.
Bartram, F. E., The Cottage, Carlton, Sharnbrook, Beds.
Clarke, W. Y., C. of E. School, Raunds, Wellingborough.
Harris, G. F., Junction Road, Cowley, Oxford.
Hogg, W., 16 Copenhagen Road, Gillingham, Kent.
Jones, F. R., School House, Gravel Hill, Henley-on-Thames.
120. Manning, W., Burrington School, Ludlow.
Pritchard, R. T., Elm Tree Farm, Llanymynech, Mont.
Roberts, John, National School, Llandinorwig, Cwmyglo S.O.
Saxby, L., School House, Gravel Hill, Henley-on-Thames.
Snook, J. H. T., 37 Wolseley Gardens, Chiswick, W.
Sutcliffe, L., Tower View, Hockenhull Lane, Tarvin, Chester.
Williams, W. E., Wesleyan School, Kilkhampton, Cornwall.
Bray, H. E., The School, Almondsbury, Bristol.
Cheeseman, G. W., 1 Myrtle Villas, Ham, Richmond, Surrey.
Munro, F. W., School House, Ringwood, Hants.
134. Nicholson, D. H., Hermitage House, Staple Hill, Bristol.
Sandy, R. E., Denton, Grantham, Lincs.
Travell, A., Loughton, Bridgnorth.
Webb, T. R., 56 North Bar, Banbury.
Law, E. F., 54 Dogsthorpe Road, Peterborough.
141. Page-Wood, A. H., 113 Boundary Road, St. Helen's, Lancs.
Rowlands, J. P., Council School, Brynsiencyn, Anglesey.

141. Sedley, L. W., Downham, Ely, Cambs.
Swinburne, E. M., 12 Wiverton Road, Sherwood Rise, Nottingham.
Walker, P. R., School House, Earlswood, Hockley Heath, Warwickshire.

147. Barrass, J. W., 33 Pinfold Gate, Loughborough.
Groome, N. L., 32 Park Road, Rushden, Northants.
Hewitt, F. E. A. T., 17 Grosvenor Square, Lower Broughton, Manchester.
Linder, E. M., Stratford St. Andrew, Saxmundham.
Lucas, R. C., The Schools, Clanfield, Oxon.
Marsh, P. R., West View, Ash Vale, Surrey.
Porch, P., The Villa, Myddle, Shrewsbury.
Scutt, J. A., 14 Alexandra Road, Blandford, Dorset.
Trott, L. H., School House, Kentisbeare, Cullompton.
Tuffin, E. A., 33 Wyndham Road, Kingston, Surrey.
Williams, J. M., Bryn Hyfryd, Ruthin, N. Wales.

158. Bowley, J. H., St. Wilfrid's Cottage, Hailsham.
Clark, E., 84 Newton Road, Rushden, Northants.
Edwards, J. R., 38 Downend Road, Kingswood, Bristol.
McPhail, D., 12 Melton Road, Wellingborough.
Norris, C. M., School House, Frittenden, Kent.
Parry, J. G., 17 Station Terrace, Cwm, Monmouth.
Rosamond, J., Brampton, Huntingdon.
Thompson, H., 53 Fairford Terrace, W. Stanley, Co. Durham.
Walker, E. O., 29 King Street, Northampton.

167. Callear, W. P., 29 Freezland Cottage, St. George's, Wellington, Salop.
Castle, A., 7 Albert Terrace, Newland, Banbury, Oxon.
Cawood, E. J., Mosley Cottage, Horsforth, Leeds.
Holgreaves, A. L., Hepple, Rothbury, Northumberland.
Parsons, F., Church Cottage, Limpsfield, Surrey.
Vernon, B., Post Office, Old Hednesford, Stafford.

173. Barton, F. H., Stowupland C. School, Stowmarket, Suffolk.
Clarke, R., 14 Brunswick Road, Norwich.
Dean, F., 109 High Street, Swallownest, Sheffield.
Dorman, B. O., 45 Dickens Street, Peterborough.
Hampton, E. J., 9 Cross Street, The Leys, Tamworth.
Tanner, E. W., 15 Elvaston Road, Victoria Park, Bristol.
Worman, E. J., 70 Osborne Road, Forest Gate, Essex.

180. Allen, C., 132 Nottingham Road, Eastwood, Notts.
Bunchett, F., 1 Myrtle Villas, Mortlake, S.W.
Channing, J. H. F., Industrial School, Desford, Leicester.
Edwards, L., 46 Scotland Street, Ellesmere.
Hawkins, J. E., Severn House, Shirley, Southampton.
King, A. L., The School House, Godshill, Fordingbridge, Hants.
Kyme, J. G., School House, Newton, Dalton-in-Furness.
Smith, M. H., Shelton Cottage, Oulton Broad, Lowestoft.
Tolerton, G. H., Malt Farm, Tackley, Oxon.

189. Blakemore, J. E., Leiston, Suffolk.
Brown, W. J., 45 Seymour Gardens, Twickenham.
Gale, L., Talana, Bostock Avenue, Abingdon.
Niblett, P. B., 1 Crown Street, Newark-on-Trent.
Pargeter, E. W., Borough Hall, Stockton-on-Tees.
Teale, A., 15 Terrace Road, Parkgate, Rotherham.

195. Berry, R. G., Junction Road, Cowley, Oxon.
Hawker, F. G., 26 Croft Road, Bromley, Kent.
Llewellyn, D. G., Llwyn Gwyn Farm, Rudry, Caerphilly, Glam.
Taylor, R., The School, Adel, Leeds.
Ward, C. A., School House, Caistor, Lincs.
Woods, J. E., School House, Byton, Presteign, Radnorshire.
Wray, W. V., Wittering, Chichester, Sussex.

202. Hughes, G. A., Sarnau School, Llandderfel, Corwen.
Pierce, J. M., The Nook, Dale Street, Rugby.
Styles, S. A., 80 Muirkirk Road, Catford, S.E.

205. Hammond, M., 7 St. James's Terrace, High Street, S., East Ham.
Skelton, V. G., Oriel House, Scarborough Road, Filey.
Thornley, J. L., 16 Park Road, Shaw, Oldham.

208. Francombe, E. M., The Limes, North Street, Downend, Bristol.
Thomas, W. R., 147 Mount Pleasant Road, Ebbw Vale, Mon.

INTERNATIONAL CONGRESS OF ENTOMOLOGY.

THE first Congress was held at Brussels in 1910, and the second met at Oxford in August 1912, under the presidency of Professor E. B. Poulton, D.Sc., F.R.S., and was attended by leading entomologists from all parts of the world, including eighty-eight from Great Britain and Ireland, eighteen from the United States, thirteen from Germany, nine from Belgium, six from France, and four each from Holland, Hungary, and Spain. The other countries represented were Austria, Sweden, Switzerland, Turkey, Egypt, and the Sandwich Islands. In addition, there were official representatives of the Colonial Office and the Government of India; also of Canada, the Australasian States, Borneo, British East Africa, and of various Societies in this country. The Royal Horticultural Society was represented by Sir Daniel Morris, K.C.M.G., D.Sc., V.M.H., &c.

The Congress was opened in the University Museum at Oxford on August 5 with an interesting address by the President, in which he devoted attention to the many processes by which a species by natural selection seeks to maintain its place in the insect world.

Ten papers were presented dealing with the insect pests of cultivated plants. As mentioned in the retrospect published in the *Times*, in none of the sections "was greater interest shown than in the Economic and Pathological, where methods of combating insects destructive to agriculture, horticulture, and forests were dealt with by many delegates appointed by the Colonial and foreign Governments." A paper on "The Necessary Investigation with Relation to Insect and Fungus Enemies of Plants Preliminary to Legislation" was presented by Mr. A. G. L. Rogers (officer in charge of the Horticultural Branch of the Department of Agriculture), and led to an interesting discussion. Mr. Rogers' practical suggestions were accepted by the Congress, which unanimously resolved to support the proposed formation by the International Institute of Agriculture at Rome of an International Commission to deal with the problem as the best means to secure the greatest amount of protection with the least injury to international trade in national products.

From the horticultural point of view, and as a practical demonstration of the place of bionomics (the study of the life history) in economic entomology, a paper on "Aphides Attacking Cultivated Peas" deserves notice. (See p. 256.) In this, Professor F. V. Theobald, F.E.S., pointed out that the suspected pea pests of the genus *Macrosiphum*, the green dolphin of peas, contained more species than was supposed, and a study of the life history revealed the fact that the earlier phases of the pest were passed upon clover. In addition to garden peas, the pest also occurs on Lathyrus (the everlasting pea). In regard to treatment, Professor Theobald stated that spraying with soft soap and

quassia or tobacco wash easily killed the aphis on garden peas, but these sprays could not be conveniently applied to field peas, as there was not sufficient space between the rows to allow their use owing to the tangled growth. It was suggested that cultural methods could probably be devised which would enable a check to be applied to the migration of the pest from the clover to the peas, and in conjunction with this the eradication, wherever possible, of the wild Lathyrus in hedgerows was advocated.

It may be added that during the entire Congress the hospitality of the University was extended to the members, and several excursions were organized for their benefit. Special mention may be made of the welcome accorded by Mr. Lewis Harcourt, M.P., Secretary of State for the Colonies, to his beautiful garden at Nuneham, and to the reception by the Hon. Walter Rothschild at his unrivalled private museum at Tring. The closing feature of the Congress, a banquet at Wadham College organized by the Bursar, Dr. F. A. Dixey, F.R.S., was also a great success.

It was announced that the Third International Congress of Entomology will be held at Vienna in 1915 under the presidency of Dr. A. Handlirsch.

NOTES ON RECENT RESEARCH

AND

SHORT ABSTRACTS FROM CURRENT PERIODICAL LITERATURE, BRITISH AND FOREIGN,

AFFECTING

HORTICULTURE & HORTICULTURAL SCIENCE.

JUDGING by the number of appreciative letters received, the endeavour commenced in volume xxvi. to enlarge the usefulness of the Society's Journal, by giving an abstract of current Horticultural periodical literature, has met with success. It has certainly entailed vastly more labour than was anticipated, and should therefore make the Fellows' thanks to those who have helped in the work all the more hearty.

There are still, we feel, some departments of Horticulture and Horticultural Science very imperfectly represented in these abstracts, and the Editor would be grateful if any who have time at command, and who are willing to help in any special direction in this work, would communicate with him. He desires to express his most grateful thanks to all who co-operate in the work, and he ventures to express the hope that they will all strictly adhere to the general order and scheme of working, as the observance of an identical *order* can alone enable the Editor to continue to cope with the work. The order agreed on is as follows :—

1. To place first the name of the plant, disease, pest, &c., being noticed ; and in this, the prominent governing or index word should always have precedence.

2. To place next the name, when given, of the author of the original article.

3. Then, the abbreviated form of the name of the journal, &c., in which the original article appears, taking care to use the abbreviation which will be found on pp. 349, 350.

4. After this, a reference to the number, date, and page of the journal in question.

5. If an illustration be given, to note the fact next, as "fig.," "tab.," or "plate."

6. After these preliminary necessities for making reference to the original possible for the reader, the abstract or digest should follow, ending up with the initials of the contributor affixed at the close of each Abstract or Note.

Names of those who have kindly consented to help in this Work.

Baker, F. J., A.R.C.S., F.R.H.S.
Ballard, E., F.R.H.S.
Beer, R., B.Sc., F.L.S., F.R.H.S.
Boulger, Professor G. S., F.L.S., F.R.H.S.
Bowles, E. A., M.A., F.L.S., F.E.S., F.R.H.S.
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Cayley, D. M.
Chittenden, F. J., F.L.S., F.R.H.S.
Cooke, M. C., M.A., LL.D., A.L.S., F.R.H.S., V.M.H.
Cotton, A. D., F.L.S.
Darlington, H. R., F.R.H.S.
Druery, C. T., V.M.H., F.L.S., F.R.H.S.
Dykes, W. R., M.A., F.R.H.S.
Farmer, Professor J. B., M.A., D.Sc., F.R.H.S.
Groom, Professor Percy, M.A., D.Sc., F.L.S., F.R.H.S.
Hartog, Professor Marcus, D.Sc., M.A., F.L.S., F.R.H.S.
Henslow, Rev. Professor Geo., M.A., F.L.S., F.R.H.S., V.M.H.
Hodgson, M. L., F.R.H.S.
Hooper, Cecil H., M.R.A.C., F.R.H.S.
Horne, A. S., B.Sc., F.G.S., F.R.H.S.
Houston, D., F.L.S., F.R.H.S.
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Kerridge, Rev. A. A., M.A., F.R.H.S.
Long, C. H., F.R.H.S.
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Petts, Alger, F.R.H.S.
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Reuthe, G., F.R.H.S.
Scott Elliot, G. F., M.A., B.Sc., F.L.S., F.R.H.S., F.R.G.S.
Smith, William G., B.Sc., Ph.D., F.R.H.S.
Swire, W., F.R.H.S.
Veitch, Harry J., F.L.S., F.Z.S., F.R.H.S.
Voss, W. A., F.C.S, F.R.H.S.
Webster, A. D., F.R.H.S.
Welby, F. A., F.R.H.S.
Whittles, W., F.R.H.S.
Williams, S. E., F.R.H.S.
Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope	Agr. Jour. Cape G.H.
Annales Agronomiques	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort.	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg	Ann. Jard. Bot. Buit.
Annals of Botany	Ann. Bot.
Beiheft zum Botanischen Centralblatt	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Broteriana	Bol. Soc. Brot.
Botanical Gazette	Bot. Gaz.
Botanical Magazine	Bot. Mag.
Bulletin de la Société Botanique de France	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad	Bull. Bot. Dep. Trin.
Bullettino della R. Società Toscana d' Orticultura	Bull. R. Soc. Tosc. Ort.
Canadian Reports, Guelph and Ontario Stations	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie	Cent. f. Bact.
Chronique Orchidéenne	Chron. Orch.
Comptes Rendus	Comp. Rend.
Contributions from U.S.A. Herbarium	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées	Dict. Icon. Orch.
Die Gartenwelt	Die Gart.
Engler's Botanische Jahrbücher	Eng. Bot. Jah.
Gardeners' Chronicle	Gard. Chron.
Gardeners' Magazine	Gard. Mag.
Gartenflora	Gartenflora.
Journal de la Société Nationale d'Horticulture de France	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agricult. Victoria	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Science	Jour. Agr. Sci.
Journal of Botany	Jour. Bot.
Journal of Chemical Society	Jour. Chem. Soc.
Journal of Economic Biology	Jour. Econ. Biol.
Journal of Economic Entomology	Jour. Econ. Entom.
Journal of Genetics	Jour. Gen.
Journal of Horticulture	Jour. Hort.
Journal of the Board of Agriculture	Jour. Bd. Agr.
Journal of the Linnean Society	Jour. Linn. Soc.
Journal of the Royal Agricultural Society	Jour. R.A.S.
Journal S.E. Agricultural College, Wye	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte	Kais. Ges.
La Pomologie Française	Pom. Franç.
Le Jardin	Le Jard.
Lebensgeschichte der Blutenpflanzen Mitteleuropas	Lebens. d. Blutenpfl.
Mendel Journal	Mendel Jour.
Naturwiss. Zeitschrift Land und Forst	Nat. Zeit. Land-Forst.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Oesterreichische Garten-Zeitung	Oester. Gart. Zeit.

Journals, &c.	Abbreviated title.
Orchid Review	Orch. Rev.
Orchis	Orchis.
Phytopathology	Phytopathology.
Proceedings of the American Pomological Society	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry.
Queensland Agricultural Journal	Qu. Agr. Journ.
Reports of the Missouri Botanical Garden	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev. Hort.
The Garden	Garden.
Transactions Bot. Soc. Edinburgh	Trans. Bot. Soc. Edin.
Transactions of the British Mycological Soc.	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc.	Trans. Mass. Hort. Soc.
Transactions Royal Scot. Arboricultural Soc.	Trans. Roy. Scott. Arbor. Soc.
U.S.A. Department of Agriculture, Bulletins	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.

† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Abutilons. By Numa Schneider (*Rev. Hort.* pp. 32-34, Jan. 16, 1912).—An interesting article giving a descriptive list of numerous floriferous varieties and suggestions as to propagation and cultivation.
C. T. D.

Abutilons, Hybrid. By R. de Noter (*Le Jard.* xxv. 593. p. 328, Nov. 5, 1911; coloured plate.—A plea for the Abutilon (× 'de Noter') in bedding out, as an alternative to Begonias and Pelargoniums. These hybrids, which are all fertilized from 'Triomphe,' if sown Jan.-Feb. in the greenhouse or hot-bed, flower in May, and can be bedded out. In September they may be lifted back to the greenhouse, or any place free from frost (in fact they are said to survive − 5° C.), kept almost dry, and planted out again the next spring. The eighty varieties offered by M. de Noter all have large cup-shaped corollas, 5-8 cm. across, instead of the old bell-shaped flowers.—*F. A. W.*

Agave marmorata (*Bot. Mag.* t. 8442).—Mexico. Family *Amaryllidaceae*; tribe *Agaveae*. Rosette 2 yards in diameter; leaves 44 inches long; inflorescence 12 feet tall; perianth bright yellow.
G. H.

Agave protuberans (*Bot. Mag.* t. 8429).—Mexico. Family *Amaryllidaceae*; tribe *Agaveae*. Herb; tuber, globose, 2 inches wide. Leaves somewhat fleshy, 6-8 inches long, green blotched with brownish-purple; scape 2 feet high; spike 4 inches long, dense; perianth, greenish blotched with purple.—*G. H.*

Almond Peaches. By Pierre Parry (*Le Jard.* xxv. 595, p. 356). An interesting discussion on the nature of certain hybrids of peaches and almonds produced by M. Beaumont at Bellenavis (Allier). For some years these were held to be ornamental only, there being a fine show of blossom but no fruit. In 1908, however, a quantity of fruits formed, from which twenty-five young plants were raised. This fertility tends to show the close relationship between peaches and almonds as upheld by Knight and by Augustin Saferet, grandfather of M. Parry.—*F. A. W.*

Angiopteris evecta, On the Vegetative Multiplication of. By W. Docters van Leeuwen (*Ann. Jard. Bot. Buit.* ser. ii. vol. x., pt. 2, pp. 202-209; 1912; 1 plate and 2 text figs.)—The giant fern *Angiopteris evecta* produces four potential bud-rudiments upon each of its leaf-bases. The leaf-blade and petiole are shed by the plant after two or three years, whilst the leaf-base persists for some years

longer. After a time, however, the leaf-base also falls to the ground, and thus one or more of the rudimentary buds develops. It produces leaves and roots which penetrate the ground, and then the bud is able to carry on an independent existence as a separate individual. The development of the buds is described in detail.—*R. B.*

Anthyllis Studies. By Wilh. Becker (*Beih. Bot. Cent.* Bd. 29, Abt. ii. Heft 1, pp. 16-40).—The author gives a complete sketch of the distribution of various more or less marked species of *Anthyllis* in every country in Europe, North Africa, and Abyssinia (only five counties in England are mentioned, and no Scotch or Irish localities). Each form is critically examined.

After this detailed revision of all known species, he draws the following conclusions:—

(1) The chief types of neighbouring areas are connected morphologically through "irrelevant" forms.

(2) In consequence of local differences in climate, the chief types are divided out in sub-types both by altitude above the sea and by horizontal distance.

(3) Neighbouring forms at different altitudes are morphologically the most closely allied. They can be distinguished as forms of the plain, middle mountains, and high mountains.

(4) Usually two chief types—*Vulneraria* and *vulgaris*—can be distinguished, the first in more or less dry, and the second in more or less wet habitats. The first has more leaves, more pinnae, and is more or less hairy.

(5) The corolla and calyx is yellow or pale in more or less wet situations; in drier and warmer districts the red colour is more pronounced.

(6) There is a prompt response in form to the smallest climatic variation. These closely related forms are so little different and distinguished by such secondary characters that a special recognition by name is not required (*am Platze*). That the description of scarcely distinguishable forms is a thing of naught (*ein Unding*) is clear from the fact that the authors themselves do not recognize them again.

(7) The original type inhabited the Alps and thence spread not only north and south, but east and west.

(8) All the names mentioned in the paper, except *A. vulnerarioides*, Bonj., are forms of one collective species.—*G. F. S. E.*

Apples, Inter-Pollination of. By W. J. Allen (*Agr. Gaz. N.S.W.* vol. xxii., pt. xi., pp. 1001-1003).—Some varieties of apples and pears rarely fertilize themselves. The most productive orchards are generally those containing many varieties. Only three or four rows of any one kind should be planted together.—*S. E. W.*

Argemones, Hybrid. By P. L. de Vilmour (*Rev. Hort.* pp. 277-9, June 16, 1912; coloured plate and woodcuts).—The plate represents several hybrid forms of very attractive flowers of the Poppy

type of the order to which the genus belongs (*Papaveraceae*), and the woodcuts, the parents concerned, *Argemone mexicana* and *A. platyceras*, and the modifications of the offspring obtained in the second generation, which varied very widely in habit and colour and shape, some of the flowers being more or less double, and the colour usually of a bright yellow, varying considerably also.—*C. T. D.*

Asparagus, Enemies of. By W. J. Goverts (*Gartenflora*, vol. lxi., pt. xi., pp. 253-255).—The larvae of the Owl moths, *Mamestra oleraceae* and *M. chenopodii*, attack the stems of asparagus both above and below ground. The moths are destroyed by means of petroleum lanterns, provided with openings. At the bottom is a receptacle containing treacle. The asparagus-fly, *Platyparea poeciloptera*, produces grubs in April and May, which bore into the stems and penetrate to the roots, causing the foliage to fade and the roots to decay. Burn the old stalks, catch the flies by inserting in the asparagus-bed wooden pegs smeared with liquid glue. The beetles *Crioceris asparagi* and *C. duodecimpunctata* are well-known pests. Asparagus-rust (*Puccinia asparagi*) attacks the stems and foliage. *Rhizoctonia violacea* attacks the roots. The diseased parts are cut away and permanganate of potash is applied to the wounds. *Peziza Fuckeliana* lives in the stems. Attacked stems must be cut down and burned.—*S. E. W.*

Aspens, their Growth and Management. By W. G. Weigle and E. H. Frothingham (*U.S.A. Dep. Agr.*, *Forest Service*, *Bull.* 93; May 31, 1911).—These are treated from a purely economic point of view, their value in that way being very considerable. Pulpwood logging has depleted the North American forests of much of their popular timber, but the trees spring up so readily where forest fires have occurred that the amount still available is quite considerable.

A. D. W.

Bacteriological Studies of the Soils of the Truckee-Carson Irrigation Project. By K. F. Kellerman and E. R. Allen (*U.S.A. Dep. Agr.*, *Bur. Pl. Ind.*, *Bull.* 211, April 1911).—The soil investigated was an arid one, and attempts were made to determine the activities of the ammonifying, nitrifying, and denitrifying bacteria especially. These types of bacteria were well represented in the soil and universally distributed, becoming physiologically active as soon as favourable conditions were provided. Lack of proper decay, &c., is due to unfavourable bacterial conditions brought about by certain physical and chemical conditions. Nitrification is active at greater depths than in Eastern soil, and is intense, while the conditions rarely favour denitrification.—*F. J. C.*

Bambarra Ground-Nut, Voandzeia subterranea (L.) Thon., The Home of. By H. Harms (*Not. König. Bot. Berlin*, vol. v. No. 49, pp. 253-258; June 1912).—A great deal of uncertainty exists regarding the actual habitat of the Bambarra ground-nut (*Voandzeia subterranea*). Linnaeus described this species, and gives its home as

Brazil and Surinam. These specimens, however, were collected by Dahlberg (as seed) in Surinam, where they were most certainly cultivated and not wild. Later writers have variously given the home of this plant. Harms has examined the collection brought from the Cameroon district by Ledermann, in which specimens of *Voandzeia subterranea* were represented, and compared these with the specimens brought from North Nigeria by Dalziel, and concludes that the Cameroon district and North Nigeria (Kilba country) are the localities in which this plant grows wild.

It is still unknown, as Harms points out, whether *Voandzeia* produces over- or under-ground cleistogamous flowers, or whether the accounts which have been given of female flowers which penetrate into the ground rest upon an error of observation.

It is often said that *Voandzeia* yields a considerable quantity of oil, but this is incorrect.—*R. B.*

Begonia dichroa (*Bot. Mag.* t. 8412).—Brazil. Family *Begoniaceae.* Tall herb. Leaves full-grown, ovate-oblong, 9-12 inches long; many-flowered; perianth-segments 4, pink; flower 1½ inch across.

G. H.

Begonia ricinifolia rosea grandiflora (*Rev. Hort.* p. 50, February 1, 1912).—This has resulted from a cross between *B. ricinifolia* and *B.* 'Gloire de Lorraine,' and appears to be a desirable addition to winter flowering Begonias, flowering from the end of November to January or February if housed in pots in September. Foliage ornamental, very floriferous, carrying long-stalked panicles of flower 18 inches high, three times as large as those of *B. ricinifolia*, brilliant rose-pink or white slightly roseate. Raised by Ferard, Paris.

C. T. D.

Berberis Wilsonae (*Bot. Mag.* t. 8414).—China. Family *Berberidaceae;* tribe *Berbereae.* Shrub of low, spreading habit, 2-4 feet high; leaves ¼-1 inch long; flowers golden-yellow.—*G. H.*

Birds, Insectivorous, of New South Wales (*Agr. Gaz. N.S.W.* vol. xxii., pt. x., 842, 843; pt. xi., pp. 947, 948; vol. xxiii., pt. i., pp. 141, 142; and pt. iii., pp. 234, 235; 8 col. plates)—The Laughing Jackass *Dacelo gigas* eats snakes, beetles, rats, mice, centipedes, lizards, and sometimes chickens. The More Pork, *Podargus strigoides*, devours insects, slugs, and mice. It is nocturnal in its habits. The Magpie, *Gymnorhina tibicea*, does some damage to the crops, but is on the whole a friend to the farmer. The Pee-wee, *Grallina pictata*, is strictly insectivorous, so also are the Mistletoe bird, *Dicoecum hirundinaceum*, and the Welcome Swallow, *Hirundo neoxena*, the white browed Wood Swallow, *Artamus superciliosus*, and the Fairy Martin, *Petrochelidon Ariel.*—*S. E. W.*

Blister Rust of White Pine. By Perley Spaulding (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 206, 1911).—The Blister Rust of white pine.

Cronartium ribicola, has been introduced into America on imported seedling stock from Europe. As there is no legislation with regard to this particular disease, the author urges that immediate steps be taken to prohibit the importation of five-leaved pines from Europe. Inspection at the port of entry is practically useless, as symptoms of the disease do not appear for one or several years after infection. The fungus cannot attack bark over twenty years old. The *Cronartium* stage occurs on numerous species of *Ribes*, including currants and gooseberries. Yellow spots (the uredo stage) are formed on the under side of the leaves. Later finger-like processes containing teleutospores grow out of the yellow spots. It is not until the teleutospores germinate and the sporidia infect the pine that the disease becomes of economic importance. The stage which develops on the pine is known as *Peridermium*. Young pines from three to twenty years old are attacked, and the fungus grows in the bark, causing swellings on the stem and considerable thickening of the bark. Eventually the stem is ringed and the tree dies. Aecidia are produced on the swollen bark in spring and break through the fissures. They are roundish bodies, yellowish-white in colour, with orange aecidiospores.

Various suggestions for the control of the disease are given, such as the destruction by burning of young diseased trees, the removal of any species of *Ribes* for a considerable distance round white-pine plantations or nurseries, the prohibition of imported five-leaved pines and species of *Ribes* unless accompanied by a guarantee from the sender, &c.

A good bibliography and figures are given.—*D. M. C.*

Brachychiton acerifolius (*Bot. Mag.* t. 8437).—Australia. Family *Sterculiaceae*. The Flame Tree, 60-120 feet high. Leaves 8-10 inches across, 5-7 partite; panicles many-flowered; flowers bright pink, $\frac{3}{4}$ inch across.—*G. H.*

Brazil Nut. By W. J. Young (*Bot. Gaz.* pp. 226-231, Sept. 1911; 1 fig. and 1 plate).—The author considers that the Brazil nut is really the fruit of *Bertholletia nobilis*, and not of *B. excelsa*, as usually supposed. Full descriptions of both species are given.

G. F. S. E.

Bromeliaceae. By V. de Coene (*Gartenflora*, vol. lxi., pt. v., pp. 113, 114).—This interesting family has almost disappeared from cultivation in Germany. The seeds seldom germinate unless they are quite fresh. It is better to propagate from offshoots in small pots containing a mixture of leaf-mould and sphagnum, in a moist, warm house. Use soft water and give no manure. The best species are *Billbergia rhodocyanea* (remaining months in flower), *Nidularium fulgens*, *N. Meyendorffii*, *Tillandsia Lindeni* (blue), *Caraguata cardinalis*, *Billbergia zebrina macrantha*, *Tillandsia musiaca*, *Aechmea fulgens*, and *A. Walbachii*.—*S. E. W.*

Brunfelsia undulata (*Bot. Mag.* t. 8422).—West Indies. Family *Solanaceae*; tribe *Salpiglossidae*. Shrub or small tree, 20 feet high. Leaves ovate-lanceolate, $2\frac{1}{4}$-7 inches long; flowers solitary in wild plants, several in cultivated, in terminal clusters; corolla white or yellowish, $2\frac{1}{2}$ inches across.—*G. H.*

Cabbage Diseases in Ohio, Two Recent Important. By Thos. F. Fanns (*U.S.A. Exp. Stn., Ohio, Bull.* 228, 1911).—*Fusarium* wilt or yellows, which had not been reported in Europe when the Bulletin was written, and blackleg or foot-rot of cabbage due to *Phoma oleracea.* The symptoms of the two diseases above named are quite distinguishable. In *Fusarium* wilt the first symptom is yellowing of the leaves, later the growth is stunted, and the lower leaves fall off at the lightest touch. This disease has proved very destructive in the cabbage-growing districts in the vicinity of Clyde and Greenspring in America, where cabbage is mainly grown for making kraut. The remedies suggested are rotation of crops, the exercise of great care to procure disease-free seed-beds, and the burning of diseased refuse, &c. The spores of the *Fusarium* remain in the soil, and thus infect fresh crops.

Black-leg, *Phoma oleracea*, produces no yellowing of the leaves or withering until later stages. White elongated oval patches occur on the stems, and small black pycnidia are scattered over the patches. The affected tissues die back, and break open. In seedlings the leaves of the affected plants become mottled with metallic bluish patches, and should be rejected when planting the crop. Red cabbage seems to be the most susceptible, then Savoys, Danish head cabbage, and, lastly, cauliflowers have been known to become infected, and a good deal of damage done. The remedies are practically the same as for *Fusarium.* Treating the seed-bed with Bordeaux (4-4-50 formula) one gallon to each square foot is recommended.

Good figures are given.—*D. M. C.*

Cabbage Top in Swedes. By T. H. Taylor, M.A. (*Univ. of Leeds, Bull.* 82, 1912; plates).—Two forms of disorder, a many-necked growth and "crumpled leaf" may be produced in swedes by the insect that has been the subject of investigation by the author. It is a minute two-winged fly named the swede midge (*Contarinia nasturtii* Kieffer). The eggs are laid upon the leaves, where the larvæ feed, hollowing out pieces of the midribs and petioles. They pupate in earthen cells and there may be several broods during the year. The paper is exceedingly well illustrated. Spraying with a mixture of lime and naphthalene on the first appearance of the winged insects in June checked the attack. Rotation of cropping checks the attack, and the sowing of swedes round the old field from which migration is likely to come will act as a trap for them.—*F. J. C.*

Calceolaria cana (*Bot. Mag.* t. 8416).—Chile. Family *Scrophulariaceae*; tribe *Calceolarieae.* Herb, perennial, tufted. Leaves

radical, oblong-lanceolate, 2 inches long; scape slender, with inflorescence 1-1½ foot long; flowers white, violet-scented, with purple spots.
G. H.

Calceolaria Forgetii (*Bot. Mag.* t. 8436).—Peru. Family *Scrophulariaceae*; tribe *Calceolarieae*. Under-shrub, 1-1½ foot high. Leaves ovate, ½-2¼ inches long; cymes lax, 6-8 inches long; corolla 4-5 lin. long, pale yellow, except for a large reddish-brown blotch inside the lower lip.—*G. H.*

Campanula arvatica (*Bot. Mag.* t. 8431).—Spain. Family *Campanulaceae*; tribe *Campanuleae*. Herb, perennial. Stems slender, 4-8 inches long; leaves basal, cordate-rounded, ⅓-inch long; cauline; rhomboid, 3-4 lin. long; flowers solitary; corolla wide, 1-1¼ inch across, blue.—*G. H.*

Campanula, New Hybrid. By F. Cayeux (*Le Jard.* xxv. 591, p. 300, Oct. 5, 1911; 1 fig.).—*Campanula* × *pyraversi*, a new hybrid derived from *C. versicolor* × *C. pyramidalis*. Recalls the character of both parents, but presents a wider range of colour.—*F. A. W.*

Canna, 'Oiseau de Feu.' By F. Bloh (*Rev. Hort.* p. 108, March 1, 1912; coloured plate).—A splendid flower of brilliant cardinal red throughout. Fine habits, and highly recommended. Raised by Vilmorin, Andrieux & Co.—*C. T. D.*

Cauliflower, Spot Disease of. By Lucia McCulloch (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 225, 1911).—This disease is found to be due to a rod-shaped motile bacterium, with rounded ends and one to five polar flagella, named by the author *Bacterium maculicolum*. It stains very readily with carbol fuchsin. It causes brownish to purplish grey spots, one to three millimeters in diameter. All parts of the leaves are affected. Where the midribs and veins are badly attacked the tissues contract, giving a puckered appearance to the leaves. Successful inoculation with pure cultures from poured plates were made, infection showing in three days as water-soaked sunken spots on the lower surface of the leaves. The leaves of attacked plants fall off.
D. M. C.

Ceanothus, A New (*Bot. Gaz.* p. 68, Jan. 1912).—Le Roy Abrams describes a new species from California.—*G. F. S. E.*

Ceratozamia, Morphology of. By Charles J. Chamberlain (*Bot. Gaz.* Jan. 1912, pp. 1-19; 1 pl. and 7 figs.).—Southern Mexico is the principal cycad region in the Western Hemisphere. *Dioon* and *Ceratozamia* may be confined to Mexico. *C. mexicana* seldom reaches six feet in height, is rather slender, has an armour of persistent leaf bases, and is often curved or prostrate. A large plant will have about 20 leaves, four to six feet long, with 40 to 50 pairs of leaflets. Half of these leaves will be dull green or even grey on account of the lichens which almost invariably incrust the older leaves.

The author describes and figures the staminate and ovulate cones. The seeds germinate as soon as they are ripe and may have no resting period; but seeds of *Dioon*, nearly three years old, germinated. The leaflets of the seedling are markedly different from those of the adult.

C. mexicana grows best in well-shaded, neither very dry nor very wet, conditions. The development of pollen and the processes of fertilization are fully described. The sperms are 220 μ in diameter and 185 μ in length (in *Zamia* 306 and 332 μ). They swim rapidly, bumping against each other and against the sides of the tube. Individuals have been observed in movement for six hours.

The embryo is also fully described.—*G. F. S. E.*

Cereus Silvestrii (*Bot. Mag.* t. 8426).—Argentine Republic. Family *Cactaceae*; tribe *Echinocacteae*. Herb; prostrate, succulent. Stem 1¼-4 inches long; flowers showy, 1½ inch across, brilliant orange-scarlet.—*G. H.*

Chaparral. By Fred G. Plummer (*U.S.A. Dep. Agr., Forest Service, Bull.* 85; July 17, 1911).—The name Chaparral is not very familiar, and may best be described as a mixed forest of stunted trees, and is the result of peculiar climatic conditions. The trees are small, with gnarled trunks and boughs, principally evergreen, and consist mainly of four species of oak, the Californian laurel, and *Castanopsis chrysophylla*, and many other shrubs and low-growing trees. In addition to conserving the water-supply the Chaparral's chief utility lies in its value as fuel and for fencing and forage.—*A. D. W.*

Citrus, Scaly Bark or Nail-Head Rust. By H. S. Fawcett (*U.S.A. Exp. Stn., Florida, Bull.* 106, June 1911).—This disease is due to a variety of *Cladosporium herbarum*, named by the author *C. herbarum* var. *citricolum*. It attacks fruit and bark, and appears mainly on sweet orange trees.

The remedies recommended are:—

(i) Top working—*i.e.* grafting grape fruit, mandarins and tangerines instead of other sweet oranges.
(ii) Heading back and treatment with Bordeaux mixture.
(iii) Spraying to prevent the fruit spotting.
(iv) Pruning out of dead wood and badly diseased limbs.

Good figures are given illustrating the life history of the fungus and the effects of the disease and the preventive treatments on the host trees.—*D. M. C.*

Citrus Tree Scale. By O. Brooks (*Agr. Gaz. N.S.W.* vol. xxii., pt. xii., p. 1072).—A mixture of 1 gallon of red oil, 2 lb. of soft soap in 35 gallons of water, is effective in killing scale on Citrus trees. It should not be used after soda wash.—*S. E. W.*

Club-root, The Comparative Susceptibility of Cruciferous Plants to Plasmodiophora brassicae. By G. C. Cunningham (*Phytopathology*, ii. pp. 138-142; Aug. 1912).—The author concludes

that there is a wide range of susceptibility among cruciferous plants, not only among the genera, but among the species in the genera and among the varieties in the species. *Lepidium campestre* (a common weed) showed 38.7 per cent. clubbed, while *L. sativum* was free. The black Spanish radish showed 65.6 per cent. clubbed, Giant radish 16.9 per cent. 'Rock Red' cabbage showed a susceptibility of 100 per cent., 'Hollander' of 73.5 per cent. This raises the question of an immune variety of cabbage.—*F. J. C.*

Coelogyne. By R. Wagner (*Oestr. Gart. Zeit.* vol. vii., pt. i., pp. 2-7; 2 figs.).—The species of *Coelogyne* discovered in 1893 are *C. tenuis* and *C. borneensis* (neither of any horticultural importance), *C. Clarkei*, *C. Sanderae*, brown and orange, *C. MacDonaldii* from the New Hebrides, pale green with brown spots, *C. Mossiae* from the Nilgiris, with beautiful white flowers, *C. longibracta* from Perak, with large fragrant yellow flowers.

C. Swaniana and *C. papillosa* were brought to notice in 1894. The latter grows on Kina Balu in Borneo, 11,000 feet above sea-level. Four species were added to the list in 1895—viz., *C. carinata* from New Guinea, *C. lamellata*, a native of Upola, and *C. lycastoides*, with large green flowers, and *C. Veitchii*, with white flowers, both from New Guinea.

In 1896 the insignificant *C. prasina* was found on Kedah Peak, about 4000 feet above the sea; also *C. casta* from Selangor, with large white flowers with yellow markings; *C. pachybulbon* from Siam, and *C. quadrangularis* found growing on trees in Perak.

Two new species were discovered in 1898—*C. zeylanica* and *C. pulchella*. The latter has numerous white and brown flowers.

S. E. W.

Conifers, Layering among. By William S. Cooper (*Bot. Gaz.* pp. 369-379, Nov. 1911; 1 fig.).—The author describes and figures cases of layering of *Abies balsamea*, as found in Isle Royale, Lake Superior. In one case a fifth descendant, by layering, was discovered. It occurs in large mature trees as well as in small and young specimens. Black Spruce, White Spruce, Tamarack, and Arbor Vitae were found to show layering.

The author states that it is most common at the Arctic and mountain timber lines. The author considers that it is of importance in natural forest conditions.—*G. F. S. E.*

Corokia Cotoneaster (*Bot. Mag.* t. 8425).—New Zealand. Family *Cornaceae*; tribe *Corneae*. Shrub, 4-7 feet high. Leaves in groups of threes, 5-6 lin. long; flowers axillary, solitary, ½ inch across, yellow; fruit drupe-like, red, 5 lin. long.—*G. H.*

Cotton Wilt and Root-knot, Control of. By W. A. Orton and W. W. Gilbert (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 92, 1912).—Cotton wilt is due to a fungoid disease present in the soil, and root-knot to the attacks of an eelworm which forms knots in the roots.

The wilt can be controlled by growing the disease-resistant varieties now on the market, but root-knot can only be controlled by rotation and the growing of crops resistant to eelworm. A list of such crops is given; it includes barley, wheat, rice, winter oats, iron cowpea, &c. The organization of a co-operative campaign is suggested to utilize all existing agencies, and put wilt-control on a self-supporting basis, by outlining methods of control, by providing sufficient seed of resistant varieties, and furnishing all the information necessary to any farmers or workers who might wish to keep up the standard of their stocks by breeding and selection, &c.—*D. M. C.*

Cotyledon subrigida (*Bot. Mag.* t. 8445).—Mexico. Family *Crassulaceae.* Herb, shortly stemmed, succulent. Leaves rosulate, 4-6 inches long, $2\frac{1}{2}$ inches wide; peduncles $1\frac{1}{2}$ foot high; sepals spreading, glaucous; corolla $\frac{4}{5}$-inch long, 5-angled, brilliant orange above, yellowish lower, glaucous.—*G. H.*

Crassula Barklyi (*Bot. Mag.* t. 8421).—South Africa. Family *Crassulaceae.* Succulent herb, 1-2 inches high. Leaves opposite, imbricated, 2-3 lin. long; flowers terminal, capitate; corolla white, lobes 3 lin. long.—*G. H.*

Creosote after their Injection into Wood, Volatilization of various Fractions of. By C. H. Teesdale (*U.S.A. Dep. Agr., Forest Service, Circ.* 188; Oct. 17, 1911).—A valuable paper, inasmuch as a knowledge of the volatilization of creosote from timber after injection is of great importance.—*A. D. W.*

Crotons. By F. Weber (*Gartenflora*, vol. lxi., pt. iv., pp. 86-90).—To keep Crotons free from insect pests, spray with a solution of dextrine (1 lb.) in 18 pints of warm water, to which 1 lb. of tobacco extract is added. After three days spray well with water.—*S. E. W.*

The Relation of Crown Gall to Legume Inoculation. By K. F. Kellerman (*U.S. Dep. Agr., Bur. Pl. Ind., Circ.* 76).—This circular draws attention to the fact that the micro-organism, *Bacterium tumefaciens*, which Erwin F. Smith has so successfully investigated, and which causes crown gall in orchard trees, tomatos, sugar-beet, roses, and various other plants, can also attack certain legumes, such as alfalfa, red clover, and alsike. The bacterium causes nodules on the roots not unlike those of the nitrogen fixing organism of Leguminosae, *Pseudomonas radicicola*, but on closer inspection it can be seen that with *Ps. radicicola* the nodule is merely an outgrowth of the root, whereas the crown gall tumour causes considerable distortion and branching of the root, the rootlets springing from the gall itself. The tissues of the tumour are white as distinguished from the pinkish flesh of the leguminous nodule.

Several laboratory tests are given for distinguishing these two organisms, one of the chief being that it is very easy to find innumerable bacteria in the nodule; while on the other hand in the crown gall

it is very difficult even for the expert to detect *Bacterium tumefaciens* in situ.

The author also points out that in all orchard or sugar-beet regions in America the possible danger of crown gall infection through leguminous crops must be considered. The use of soil for inoculating alfalfa on clover land, if selected at random may be a serious menace to any succeeding sugar-beet crop or to land eventually to be planted with orchard trees. He believes that besides alfalfa, crimson clover, and alsike there is reason to suspect that all the clovers may be susceptible to *Bacterium tumefaciens*.—*D. M. C.*

Cycad Trunk, The Adult. By Charles J. Chamberlain (*Bot. Gaz.* pp. 81-104, Aug. 1911. 20 figs.).—The author describes the minute anatomy of *Dioon* (two species), *Ceratozamia*, and *Zamia*. Growth rings are found in both species of *Dioon*, but only corresponded to a period of activity in the formation of crowns or cones in *D. spinulosum*. The adult trunk of this species resembles (in transverse section and histologically) that of *Cycadeoidea*.—*G. F. S. E.*

Cyclamen, New. By Graf von Schwerin-Wendisch (*Gartenflora*, vol. lxi., pt. v., pp. 119-120; 1 fig.).—*Cyclamen persicum Schwerinae*, a sport from *C. persicum*, has bell-shaped flowers; the petals rise upright from the stalk, then suddenly bend down. The blooms may be dark or bright pink or white, with red centres.—*S. E. W.*

Cypripedium bellatulum. By O. Witt (*Orchis*, vol. vi., pt. ii., pp. 19-22; 1 plate).—To ensure success plant the newly imported orchid in a mixture of potsherds and pieces of limestone. Spray moderately. When new roots appear, remove any dead old roots and re-pot in a mixture of Cypripedium compost and broken potsherds.
S. E. W.

Daphne retusa (*Bot. Mag.* t. 8430).—Western China. Family *Thymelaeaceae*; tribe *Thymelaeae*. Shrub, 2-3½ feet high, flowering in spring with the leaves. Leaves lasting till second year, 1¼-3 inches long; flowers umbellate; perianth white tinged with rose or violet; berry fleshy red, 5 lin. long.—*G. H.*

Daphne × Thauma. By R. Farrer (*Gard. Chron.* p. 22; July 13, 1912; fig.).—An account of the discovery, and a description with Latin diagnosis, of a hybrid between *Daphne rupestris* and *D. striata*.
E. A. B.

Davidia involucrata var. **Vilmoriniana** (*Bot. Mag.* t. 8432). Central and Western China. Family *Cornaceae;* tribe *Nysseae*. Tree of medium height, with linden-like foliage and capitate inflorescence with two large white bracts. Leaves 2¼-4½ inches long; bracts sessile, usually unequal, white, oblanceolate; perianth none; stamens 5-10 or more; anthers purple.—*G. H.*

Dendrobium Dearei. By E. Hiethe (*Orchis*, vol. vi., pt. ii., p. 23; 1 plate).—This *Dendrobium* requires plenty of moisture in a warm house, with shade in summer.—*S. E. W.*

Dendrobium Wardianum giganteum. By A. Heydt (*Orchis*, vol. vi. pt. iii. p. 56).—This beautiful orchid bears fragrant cream-coloured flowers from February to April. It requires a moist atmosphere and a temperature of 68° F.—*S. E. W.*

Dichapetalum venenatum (Eng. and Gilg.), **A Plant Poisonous to Cattle in German South-West Africa, with some Remarks on other Poisonous Dichapetalum.** By A. Engler (*Nat. König. Bot. Berlin*, vol. v. No. 48, pp. 244-251; Dec. 1911; 2 figs.).—The appearance and distribution of *Dichapetalum venenatum* is described. Its young leaves are readily eaten by oxen, which quickly succumb to its effects. A very few leaves are sufficient to kill an ox. The fruit, which is about the size and colour of a Mirabelle, is not unpleasant to the taste, but is poisonous. Seven other poisonous species of African *Dichapetalum* are described.—*R. B.*

Dimerosporium. By F. Theissen, S.J. (*Beih. Bot. Cent.* Bd. 29, Abt. ii. Heft 1, pp. 45-73).—This is a critical revision, with localities and bibliography of all the species of this genus.—*G. F. S. E.*

Dimorphic Leaves of Cotton and Allied Plants in Relation to Heredity. By O. F. Cook (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 221; 1912).—A study of the abrupt changes presented by leaves of cotton and allied plants which the author considers analogous to mutative variations. A distinction is drawn between the expression and transmission of plant characters as it is obvious that widely differing leaf variations presented on an individual plant are not to be explained by the theory of alternative inheritance. We quote the author: "Dimorphism and Mendelism may both be interpreted as phenomena of alternative expression. . . . The facts of heredity and breeding can be better understood if transmission be considered as including the whole ancestral series of characters. Transmission inheritance is a comprehensive process, while expression inheritance is partial and alternative, different characters being expressed in different individuals or in different stages of individual development." We think this quotation will suffice to induce students of heredity to study this bulletin, which is of considerable importance.—*E. A. Bd.*

Dioscorea, Sweet Potato. By R. de Noter (*Le Jard.* xxv. 592, p. 312, Oct. 20, 1911; 5 figs.).—This article enumerates the various species of *Dioscorea*, and advocates their use as a winter vegetable, some thirty kinds being now available. Another note on the subject of their cultivation will be found on p. 359, No. 595, of *Le Jardin*.

F. A. W.

Diospyros, Morphology of. By Stella M. Hague (*Bot. Gaz.* pp. 34-44, July 1911; 3 plates).—The author describes the develop-

ment of the flowers of *Diospyros virginiana*, the four megaspores, the development of the endosperm and embryo (polyembryony occurs), and the development of the pollen, mother-cells, and tetrads.

G. F. S. E.

Disa lugens (*Bot. Mag.* t. 8415).—South Africa. Family *Orchidaceae*; tribe *Ophrydeae*. Herb, terrestrial, 1½-2 feet high. Leaves 8-20 inches long; scape 1½-2 feet long; raceme laxly 5-15 flowered, 4-8 inches long; flowers 1½ inch long and 1 inch wide; sepals posterior, pale blue with greenish stripes, falcate; lip recurved, deeply multifid-lacerate, green.—*G. H.*

Diseases of Cultivated Plants in Ohio, A Brief Handbook of. By A. D. Selby (*U.S.A. Exp. Stn., Ohio. Bull.* 214).—Part I. treats of plant diseases in general, the relation of host and parasite, parasitic fungi, and various methods by means of which the practical man can identify and control disease in plants.

A number of diseases of trees caused by the larger Basidiomycetes (*Polyporus*, &c.), root infections, parasitic foliage, and fruit diseases, bacterial and non-parasitic diseases are briefly described and figured.

Several good standard fungicides and the methods employed in mixing them are given, both for plant and seed treatment, and the author also advocates soil treatment (especially in forcing-houses), either by heat, thorough steaming of the soil, or by the use of formaldehyde drench,

2-4 liquid lb. of formalin (40 per cent. commercial),
Fifty gallons of water.

The author then goes on to treat of storage rots in fruits, potatos, and onions.

The disinfection of onions may be carried out under the Maine formula for formaldehyde gas:—

3 lb. formalin (40 per cent.),
23 oz. potassium permanganate,

is sufficient for 1000 cubic feet of space occupied by crates or trays.

A similar treatment is suggested for stored apples and pears, but so far has not been applied.

Part II. deals with special diseases in Ohio, arranged alphabetically according to the host plants.—*D. M. C.*

Dombeya calantha (*Bot. Mag.* t. 8424).—British Central Africa. Family *Sterculiaceae*; tribe *Dombeyeae*. Shrub, 12 feet high. Leaves 3-5 lobed, 12 inches across; cymes corymbiform, 15 fld.; corolla 1½ inch across, rose-coloured.—*G. H.*

Douglas Fir, Properties and Uses of. By McGarvey Cline and J. B. Knapp (*U.S.A. Dep. Agr. Forest Service, Bull.* 88; June 1911).—An exhaustive paper on the properties and uses of the timber of the Douglas Fir, which, as the tree thrives well in almost

every part of the British Isles, will be of considerable value to foresters and others in this country. The average results of tests as to the strength of the timber when compared with that of other trees is highly instructive.—*A. D. W.*

Dune Plants, Evaporation of. By George Damon Fuller (*Bot. Gaz.* pp. 193-208, Sept. 1911; 6 figs.).—On the sand-dunes of Lake Michigan the first association to colonize moving dunes consists of the Cottonwood (*Populus deltoides*), *Salix* (2 spp.), *Prunus pumila*, and *Ammophila arenaria.* As the dune becomes fixed, a Pine association (*Pinus Banksiana*, *Juniperus* 2 spp., *Arctostaphylos*, *Rhus* spp., and seedling Oak) replaces the Cottonwood. The third stage consists of Black Oak (*Quercus velutina*), dominant with *Prunus*, *Rosa*, *Viburnum*, and several herbaceous plants.

The final or "climax" deciduous forest is a Beech-Maple association with *Tilia*, *Ostrya*, *Prunus*, &c.

Instruments recording evaporation were placed in all these associations, and results measured weekly or fortnightly from May to October.

The results were as follows:—

	Average per day c.c.	Maximum c.c.	Minimum c.c.
Cottonwood Association	21	35	10
Pine Dune	11·3	17·5	4
Oak Dune	10·3	19	5
Beech-Maple Forest	8·1	12	3

This brings out very clearly the severity of conditions in the Cottonwood dunes, which are 260 per cent. as severe for plant life as those in the Beech-Maple association.

Only xerophytic plants can endure these conditions, and probably any increase in the vegetation depends mainly on subterranean branches, for very few of the seeds are able to germinate.—*G. F. S. E.*

Echinopsis minuscula, Wel. By R. Roland Gosselin (*Rev. Hort.* pp. 84-85, Feb. 16, 1912; coloured plate).—The plate represents a remarkably pretty dwarf Cactus, forming flattened spherical papillose thorny masses, which produce abundant offsets. These are a little on the lines of *Sempervivum arachnoideum*, but without the web. Small crimson tubular flowers are freely produced. The seed germinates freely and growth appears to be more rapid than with cacti generally, and, with protection under dry conditions during the winter from October to May, they can then be transferred to the open and constitute pretty border plants.—*C. T. D.*

Elliottia racemosa (*Bot. Mag.* t. 8413).—South United States. Family *Ericaceae;* tribe *Rhodoreae.* Shrub or small tree, 20 feet high. Leaves oblong, 2¾-4 inches long; inflorescence terminal, 6-10 inches long; corolla white, 5-6 lin. long.—*G. H.*

Erica ciliaris (*Bot. Mag.* t. 8443).—South-West Europe. Family *Ericaceae*; tribe, *Ericeae.* Shrub, dwarf. Leaves, 4-nate, ciliated; flowers densely racemose; corolla nodding, rich purple.—*G. H.*

Eriostemon and Crowea. By W. Vorwerk (*Gartenflora*, vol. lxi., pt. vi., pp. 138-141; 2 plates).—*Eriostemon* and *Crowea* succeed best when they are grafted on *Correa Backhousiana.* Plant in a mixture of sandy loam and peat and grow in a cool house.—*S. E. W.*

Eucalypts in Florida. By Raphael Zon and John M. Briscoe (*U.S.A. Dep. Agr., Forest Service, Bull.* 87; April, 1911).—In several parts of the United States, particularly California, Eucalyptus growing has been carried out so successfully that experiments are now being undertaken as to the suitability of the tree for planting in Florida, where climatic conditions seem favourable. So far the results have been satisfactory, and it is anticipated that in the near future considerable tracts of suitable ground will be planted with these trees.—*A. D. W.*

Eugenias of South Africa. By R. A. Dümmer (*Gard. Chron.* pp. 127, 152, 179, and 192; August 17, 24, 31, Sept. 7; 2 figs.).—A good descriptive account of 13 species, 5 of which are new. The distribution, and, when known, the uses of the timber, and other economic aspects are very fully dealt with.—*E. A. B.*

Euphorbia gregaria (Marloth), **On the Latex of** (*Not. König. Bot. Berlin*, vol. v. No. 48, pp. 234-236; Dec. 1911).—The wax-like raw material obtained from a stem of *Euphorbia gregaria* was tested with regard to its solubility and compared in this respect with (1) pure yellow beeswax; (2) pure bleached beeswax; (3) Japanese wax. According to this examination the raw material from *Euphorbia gregaria* has the properties of wax, but is more resinous than the other kinds of wax. This resinous character detracts from its usefulness for technical purposes. No caoutchouc was found in the plant.

R. B.

Fasciation. By E. Lemée (*Rev. Hort.* pp. 163-166, April 1, 1912; with nine illustrations).—An interesting article on the various forms of fasciation and a list of a large number of plants on which it has been noted. It is sometimes induced by insect attacks, but more often of a "sportive" origin, which in many cases, as in the Celosias and other plants, is inherited so as to form permanent varieties. The illustrations show the various types assumed.—*C. T. D.*

Ferns, Cultivation of. By O. Bernstiel (*Gartenflora*, vol. lxi., pt. v., pp. 105-109).—*Adiantum farleyense* is the most beautiful member of its class. It requires a temperature of 60° F., and can only be increased by division. The following are valuable species *A. scutum*, *A. roseum*, *A. decorum*, *A. concinnum*, and *A. latum*. *A. Dutrianum*, a form between *A. elegans* and *A. cuneatum*, *A. farleyense*,

'Glory of Moordrecht' (no relation to *farleyense*), and *A. elegans gracile* are good novelties. The *Pteris* species are useful pot plants. Of the newer varieties of *Nephrolepis* the following are well worth cultivation: *Whitmanni, Piersoni, Piersoni elegans, Piersoni compacta, bostoniensis magnifica, Janki, Bernstieli, splendens,* and *davallioides furcata. Polystichum falcatum, Lomaria gibba, Polypodium aureum, P. glaucum* and *Platycerium alicorne* grow well in the dwelling-house. Soft water must be used for watering ferns. Manure is applied in the liquid form.—*S. E. W.*

Fern Culture. By Hugo Fischer (*Beih. Bot. Cent.* Bd. 28, Abt. i. pp. 192-193).—The author has found it easy to grow fern prothallia in the following solution, viz.: 1 litre water, 1 gr. KH_2PO_4, 1 gr. ammonium nitrate, ·3 gr. crystallized magnesium sulphate, 1 gr. chloride calcium, ·01 gr. iron chloride. The little ferns may reach 2 to 5 cm. in height in this solution. They should then be transferred to a suitable vessel partly filled with saturated peat. The vessel is then filled up with water (or preferably the above solution), with the plants floating in it. As the water evaporates, it must not be entirely replaced, and the young plants are able gradually to develop their roots in the peat.—*G. F. S. E.*

Fire, Protection of Forests from. By Henry S. Graves (*U.S.A. Dep. Agr., Forest Service, Bull.* 82; Aug. 12, 1910).—The best means of protecting woodlands from fire with the appliances in use and the most approved systems of organized protection are all dealt with in a masterly way in this Bulletin. The methods of fighting surface fires as adopted by the State seem well up to date.—*A. D. W.*

Forcing of Plants, Advances in the Technique of. By Dr. Alfred Burgerstein (*Prog. Rei Bot.* vol. iv. pt. 1, pp. 1-26; 1911; 7 text figs.).—This is an account of our present knowledge regarding the use of ether, chloroform, hot-water bath, steam, frost, drying, &c., in the artificial forcing of plants or branches of shrubs into early bloom. Professor Johannsen (in 1900) was one of the first to show that by subjecting branches of flowering shrubs to the vapour of ether and then bringing them into a warm temperature they could be more rapidly brought into flower than when the ether treatment was omitted. Further experiments upon the effects of ether vapour were then carried out in the Dresden Botanical Garden, and by Aymard in Montpellier.

The most useful apparatus for applying the ether, the quantity of ether which yields the best results, the time during which the plants should be left exposed to the vapour, and the most favourable temperature were all ascertained and described by the above observers and by Walter Howard in some extensive investigations upon the winter rest of plants. Lilacs, Azaleas, *Prunus* sp., *Amygdalus* sp., are among the plants giving the most satisfactory results. Chloroform exerts a similar influence upon the forcing of plants into early flower as does

ether, but is much stronger in its action. Greater precaution is, therefore, required in its use.

It had been known for some time that if lilies of the valley and some other plants had been plunged into a warm-water bath for some hours and then brought into a warm greenhouse their blooming could be considerably accelerated. The influence of the warm-water bath was first studied in detail by Hans Molisch in 1908-09. The most convenient apparatus for applying the warm-water treatment was described by Molisch, and is reproduced in Burgerstein's account. Molisch found that a nine to twelve hours' treatment with water of a temperature of 30°-50° C. gave the best results. If lilacs are required in bloom at Christmas the branches should be plunged into water at a temperature of 35° C. for ten to twelve hours and then removed to the forcing house, when they will come into flower eight to twelve days earlier than those not treated with warm water.

Alb. Hoffmann, using the warm-water bath treatment had branches of the lilac Charles X in flower on December 1 and some branches of Marie Legraye a few days earlier than this. The court gardener Kleine treated some rhizomes of lily of the valley in the middle of November with a water bath at a temperature of 38° C. for fourteen hours, and was able to bring them into flower in three weeks.

Besides the above it has been found possible to flower the following plants at Christmas by the use of the warm-water bath: *Prunus triloba*, *Malus Scheideckeri*, *Wistaria sinensis*, *Viburnum*, *Forsythia*. The same treatment was also very successful for *Azalea indica* and some roses (' Frau Karl Druschki ').

Exposure to steam has a similar effect to the warm-water bath in accelerating the appearance of bloom upon plants which are being forced, but for practical purposes the water bath is to be preferred. Another means of assisting the forcing of plants into bloom is furnished by low temperatures. Plants which have been subjected to frost will subsequently force much more quickly than those which have not. Burgerstein gives details of the researches which have been carried out on this subject, and he also deals with the drying of plants as an aid in their forcing.—*R. B.*

Forest Cover and Avalanches in the Northern Cascades. By Thornton T. Munger (*U.S.A. Dep. Agr., Forest Service, Circ.* 173; Nov. 24, 1911).—Avalanches are of frequent occurrence in the Northern Cascades, and it is the object of this pamphlet to point out what may be and has been done by tree planting to obviate the evil.

The preventive measures to be adopted are fully discussed.

A. D. W.

Forest, Crater National. By Findley Burns (*U.S.A. Dep. Agr., Forest Service, Bull.* 100; Nov. 28, 1911).—An interesting account of the Crater National Forest, which lies southwards from the Crater Lake National Park, one of the natural wonders of America, and visited

annually by a great number of tourists. As well as timber there are vast areas of grazing lands in the forest, while mining is carried out in several districts. The trees principally to be found are the Douglas Fir, the Sugar Pine, and the Incense Cedar, from all of which a good revenue is derived.—*A. D. W.*

Forest near Tabora in German East Africa. By Lieut. von Trotha (*Not. König. Bot. Berlin*, vol. vi. No. 48, pp. 212-231; Dec. 1911).—This paper gives a description of some 189 trees and shrubs growing in the forests of Tabora, with especial reference to their economic importance. Their use for European building purposes, for the manufacture of furniture, for native building purposes, and the general use of the tree to the natives is pointed out in each case. The native names of the trees are given.—*R. B.*

Forest, Olympic National: its Resources and their Management. By Findley Burns (*U.S.A. Dep. Agr., Forest Service, Bull.* 89; June 6, 1911).—This extends to about a million and a half acres, and contains one of the heaviest stands of timber in the United States. It is composed mainly of the Douglas Fir and Sitka Spruce, and, owing to the heavy rainfall, trees generally thrive exceptionally well. An excellent map of the forest district is attached. Through the district a railway runs for 160 miles, which must greatly facilitate the removal of converted timber.—*A. D. W.*

Forest Planting in the North-Eastern and Lake States. By H. S. Graves (*U.S.A. Dep. Agr., Forest Service, Circ.* 195; Jan. 29, 1912).—The true value of forest land and its rightful place among the permanent resources of the State are being quickly realized all over the American Continent.

In New England States, New Jersey, Pennsylvania, and the higher grounds of West Virginia there are large areas of treeless wastes which are well suited for the production of valuable timber. The advisability of planting these regions is discussed in the present pamphlet.

A. D. W.

Forest Students, Suggestions to Prospective. By Henry S. Graves (*U.S.A. Dep. Agr., Forest Service, Circ.* 23, Oct. 11, 1911). The suggestions to prospective forest students are valuable and to the point.

A list of Schools of Forestry is given, and the salaries available should be a temptation to the student.—*A. D. W.*

Forests, Reafforestation on the National. By William T. Cox (*U.S.A. Dep. Agr., Forest Service, Bull.* 98; Nov. 18, 1911).—The National Forests, which extend to one hundred and ninety-one and a half million acres, extend from Alaska to Porto Rico. Reafforestation of denuded areas would appear to go on constantly, and, as stated in the Bulletin, "The Forest Service has taken up in earnest this enormous task."—*A. D. W.*

Formosa, Flora of. By H. J. Elwes (*Gard. Chron.* p. 25; July 13, 1912).—A short account of two months' botanizing in the island, mentioning some of the more striking plants met with.

E. A. B.

Fruit Flies in New South Wales, Part III. By W. R. Gurney (*Agr. Gaz. N.S.W.* vol. xxiii., pt. i., pp. 75-80; 2 plates; 9 figs.).—The Island fruit fly (*Trypeta musae*) and the Ferment fly (*Drosophila obscura* and *D. melanogaster*) lay their eggs on damaged fruit. Their maggots may be distinguished from the dreaded Mediterranean (*Ceratitis capitata*) and Queensland fruit fly (*Dacus Tryoni*), and also from the Tomato fly (*Lonchaea splendida*) by means of the accompanying diagrams. The grubs of the fruit beetles (*Carpophilus pilipennis* and *C. aterrimus*) prey on damaged fruit.—*S. E. W.*

Fruit Trees, Protecting from Hares. By W. E. Henderson (*Agr. Gaz. N.S.W.* vol. xxii., pt. xi., p. 1003).—Hares do not attack trees if the stems are wrapped in paper.—*S. E. W.*

Fustic Wood, its Substitutes and Adulterants. By George B. Sudworth and Clayton D. Mell (*U.S.A. Dep. Agr.*, *Forest Service, Circ.* 184; June 9, 1911).—Probably no other timber has more substitutes than the Fustic wood (*Chlorophora tinctoria*). It yields the valuable yellow, green, and brown dyestuffs, and attains to a height of about 25 to 50 feet, with a stem diameter of 2 feet. Fustic wood is imported as chips or sticks 2 to 4 feet long, about 2,466 tons having been entered at United States ports for consumption in 1909.—*A. D. W.*

Gaultheria Veitchiana, sp. nov. By W. G. Craib (*Gard. Chron.* p. 188; Sept. 7).—A new species from Western China collected by E. H. Wilson, and closely allied to *G. Hookeri*.—*E. A. B.*

Gerbera, Seeding of. By R. Irwin Lynch (*Gard. Chron.* p. 107; August 10, 1912).—A useful note pointing out that Gerberas are self-sterile and protogynous, that pollen should be applied from older flowers to the stigmas of those flower-heads but lately opened, and concluding with instruction for sowing seeds, and the best method of growing seedlings.—*E. A. B.*

Germination and Oxygen Minimum. By Charles Albert Shull (*Bot. Gaz.* pp. 453-477, Dec. 1911; 1 fig.).—The author gives an introductory account of previous researches which may be of some interest to horticulturists. The seeds of rice and various water plants, of sunflower and other plants are said, by various authorities, to germinate in the absence of free oxygen. Other seeds require free oxygen for germination. Others, again, found that a much higher percentage of weed seeds germinated after having been frozen and thawed during the winter.

The author believes that the extremes of winter climate often destroy the seed-coat sufficiently to admit the necessary oxygen. Thus

in the special case of *Xanthium* (with which this paper deals) there are two sorts of seed (upper and lower) in the same head, and these behave differently through differences in the seed-coats.

The digestive enzymes of birds favours the germination of seeds in some cases; light is also a factor of which the action is not yet understood.

The author soaked *Xanthium* seeds for twelve hours in iced water and removed the seed-coats. His experiments were carried out with refined apparatus and with very great care. The "upper" seed at 21° C. required at least 12 mm. of oxygen, the lower 9.5 mm.

After-ripening is not apparent in any alteration of germination at ordinary temperatures and ordinary atmospheric pressure. The seeds of *Xanthium* lose the power of germination in a very few years.

G. F. S. E.

Gladioli, Improvement of Foliage of (*Rev. Hort.* p. 27, Jan. 16, 1912).—A raiser of Gladioli, M. A. E. Kunderd of Chicago, recommends selection of improved foliage as well as of the blooms only, since it can thus be rendered ornamental by increase of size, length, or width, improvement of colour, and even variegation. The stems of the flower spikes are also open to coloration by selection, and perfumed flowers are suggested as obtainable by same means.

C. T. D.

Gloxinia, A Hybrid large-flowered. By F. Bern (*Rev. Hort.* pp. 36-37, Jan. 16, 1912; coloured plate).—The plate represents a magnificent flower about 4 inches across, 8 segments, colour brilliant crimson with light pink margin, tube deep, streaked mauve inside, outside pale mauve slightly suffused with yellow; very handsome. No name given. Raised by Vilmourin, Andrieux & Co.—*C. T. D.*

Gooseberry Pest, A New. By W. J. Goverts (*Gartenflora*, vol. lxi., pt. ii., pp. 40-43; fig.).—*Pulvinaria vitis* lives as a parasite on the young and the old wood of the vine. It is also found on pear-trees and gooseberry-bushes. The reddish eggs of this scale insect may be observed in summer, covered with silky web, protruding from under the scale of the female. The larvæ crawl about the bush, but soon settle down adhering to the plant. The male exudes a scale and then passes into a pupa, and eventually into a winged insect. It is only one-ninth of an inch in length, and is provided with two delicate wings and six legs terminating in claws. The body ends in two long bristles. The wingless female is 0.3 inch long. It is covered with a reddish brown scale with black spots; the mouth consists of four bristles, which can penetrate the epidermis of the plant and reach the sap. After pairing the female degenerates, losing its legs and antennæ. To destroy this pest brush the stems of the bushes, apply tobacco extract, and wash with lime-water.—*S. E. W.*

Graft Hybrid, A New (*Rev. Hort.* p. 27, Jan. 16, 1912).—A *Robinia*, *R. glutinosa*, grafted by Dr. Udo Dammer of Berlin on *R.*

Pseudacacia, formed several shoots, one of these when grown on reproduced a fine tree, very floriferous and fruitful, but it produces branches of two kinds, the great majority bearing very small thorns which sometimes are almost entirely lacking, in which case they bear numerous lenticels, while the other comparatively few branches bear large thorns quite of the *R. Pseudacacia* type, and flowers agreeing also therewith, but with less powerful odour and producing somewhat smaller fruit.—*C. T. D.*

Gramineae, Systematic Notes on. By Ernst H. L. Krause (*Beih. Bot. Cent.* Bd. 29, Abt. ii. pp. 127-146).—The author considers that *Bromus velutinus* is specifically different from *B. secalinus*. Its distribution depends upon that of the Spelt (Wheat). *B. arduennensis* is a form (*Spielart*) of *B. velutinus*. *Lasiagrotis* belongs to *Stipa* and not to *Calamagrostis*. There is also in the paper a systematic revision of the Setariae discovered in Alsace Lorraine.—*G. F. S. E.*

Guatemala Plants, New. By John Donnell Smith (*Bot. Gaz.* pp. 45-53, July 1911).—New species of *Thouinia*, *Calopogonium*, *Hanza* (5 spp.), *Sicydium*, *Geophila*, *Tabernaemontana*, *Lisianthus* (2 spp.), *Solanum*, *Alloplectus*, and *Besleria* are described.—*G. F. S. E.*

Gumwoods, Distinguishing Characteristics of North American. By George B. Sudworth and Clayton D. Mell (*U.S.A. Dep. Agr., Forest Service, Bull.* 103; Oct. 28, 1911).—Fine species of gum (*Nyssa*) are cultivated in the United States, the timber of all being valuable from a commercial point of view. A description of each species is given, with points of identification, while the quality of timber is described, together with geographical range and a most useful list of the many popular or "trade" names.—*A. D. W.*

Haemanthus, Leaf Colour in. By Friedrich Hildebrand (*Beih. Bot. Cent.* Bd. 28, Abt. i. Heft 1, pp. 66-89).—The author crossed *Haemanthus tigrinus* on *H. coccineus*. The leaf of the former has on the under surface to a greater or less extent, dark brown transverse bars or spots, whilst the upper surface (except near the base and only occasionally) is dark green. The leaves of *H. coccineus* are a lighter green and are without any spots or bars.

The author comments on the apparently useless character of these markings on the under-leaf surface, which cannot be caused by light.

He obtained thirty seedlings which showed an extraordinary variation in leaf colour. Some showed the same sort of bars and spots as *H. tigrinus*, and even in some cases similar spots covering a third or a fifth of the *upper* surface.

Not only so, but the degree and character of spotting varied irregularly from year to year. The changes are given for each leaf of each bastard for every year from 1906-1911.

The author points out that some show in one year paternal and in another maternal characters.—*G. F. S. E.*

Heat in Respiration. By George J. Peirce (*Bot. Gaz.* pp. 89-112, Feb. 1912; 8 figs.).—The author found that peas in germination lost 4.93 calories per diem per gram of peas. Certain other experiments seem to show that the heat given out by peas under these circumstances decreases with their age. A mouse enclosed in a Dewar flask lost in half an hour's imprisonment 11.19 calories per minute, but no loss of heat could be detected in the case of two salamanders even in twenty-four hours.

This liberation of heat must be regarded as an "end product," a waste and not an essential product. The essential product may be energy. Heat loss is an unessential though an inevitable feature of respiration.—*G. F. S. E.*

Hemiboea, The Genus. By Prof. Dr. H. Solereder (*Beih. Bot. Cent.* Bd. 29, Abt. ii. Heft 1, pp. 117-126; 7 figs.).—The author after anatomical investigation of the leaves, &c., of the various species considers that the genus may remain next to the Gesneraceae.

G. F. S. E.

Heterostylous Plants, Observations on. By N. E. Stevens (*Bot. Gaz.* pp. 277-308, April 1912; 3 pl.).—The author found a great difference in the rate of development of the pollen tube in Buckwheat when legitimately and when illegitimately fertilized. In eighteen hours after legitimate pollination a proembryo was found, whilst in seventy-two hours after illegitimate pollination the pollen tubes had not reached the egg. Under natural conditions, therefore, there would be very little chance of illegitimate pollination resulting in fertilization.

The paper is for the most part a description of the cytology and embryology of Buckwheat and *Houstonia coerulea.*

The chromosomes in the anaphase of the reduction division are twice as great in the short-styled form. In the long-styled form also the central chromoscme is considerably larger in one daughter nucleus than its synaptic mate in the sister nucleus. The author compares this to the supposed sex determinant in certain insects.—*G. F. S. E.*

Hickory, Manufacture and Utilization of, 1911. By Charles F. Hatch (*U.S.A. Dep. Agr., Forest Service, Circ.* 187; Nov. 16, 1911).—In the Ohio and Mississippi Valleys Hickory occurs in greatest abundance and reaches its largest size. There are ten species of Hickory, all of which produce timber that is more or less valuable in the making of vehicles and tool handles. It is stated that no foreign country, except a little of Southern Canada, yields Hickory, and no foreign country has been successful in its cultivation.—*A. D. W.*

Hippeastrum procerum. By W. W. (*Gard. Chron.* p. 73; July 27; col. plate and fig.).—A concise account of the discovery, names, appearance, and cultivation of the so-called Blue Amaryllis.

E. A. B.

Hot Water for Retarded Flowering. By T. Boucard (*Le Jard.* xxv. 593, p. 332, Nov. 5, 1911).—Finding that his Chrysan-

themums were very belated M. Boucard brought them on and won a gold medal by watering them with warm water. In August and September they were much diseased. He first cleaned them by fortnightly washes of "soufre précipité Schloesing à la nicotine," with weekly baths of dilute surphate of iron, the strength being gradually increased up to 3 grms. per litre. From October onwards he watered them whenever required with *warm* water and dissolved chemical manure.
F. A. W.

Hydrangeas, New. By Louis Mouillère fils (*Rev. Hort.* pp. 62-3, Feb. 1, 1912; four illustrations).—A descriptive list, giving origin of a number of new varieties. One of these, 'Beauté Vendimoise,' has individual flowers nearly 4 inches across and loose corymbs about 15 inches wide—a vigorous grower, very floriferous, and highly recommended.—*C. T. D.*

Hypocalymma robustum (*Bot. Mag.* t. 8435).—West Australia. Family *Myrtaceae*; tribe *Leptospermeae*. Under-shrub, 3-4 feet tall. Leaves spreading, linear, $\frac{1}{2}$-$\frac{3}{4}$ inch long; corolla $\frac{1}{2}$ inch across; petals pink.—*G. H.*

Idaho, New Plants from. By Aven Nelson (*Bot. Gaz.* pp. 261-274, Oct. 1911).—New species are described of *Stanleya, Thelypodium, Spiraea, Potentilla, Thermopsis, Hypericum, Sphaerostigma, Onagra* (2 sp.), *Dodecatheon, Phlox, Phacelia, Pentstemon* (3 sp.).

The plants were collected by J. Francis Macbride, a boy just out of the Boise High School.—*G. F. S. E.*

Iris chrysographes (*Bot. Mag.* t. 8433).—China. Family *Iridaceae*; tribe *Irideae*. Herb. Leaves linear, $1\frac{1}{2}$ foot long; perianth brilliant dark purple, marked with golden-yellow lines and streaks on the falls, 2 inches long.—*G. H.*

Ixora lutea (*Bot. Mag.* t. 8439).—Garden origin. Family *Rubiaceae*; tribe *Ixoreae*. Shrub, 2-3 feet high. Leaves oblong-elliptic, 3-$3\frac{1}{2}$ inches long; corymbs lax-flowered; flowers, pale yellow.
G. H.

Kalanchoe. By Raymond Hamet (*Beih. Bot. Cent.* Bd. 29, Abt. ii. Heft 1, 41-44).—The author, after anatomical investigation of *Kalanchoe delagoensis* (of which no satisfactory description had been published), considers that it is identical with *K. verticillata*, and changes this name to *K. tubiflora*.—*G. F. S. E.*

Koelreuteria Henryi, sp. nov. By E. A. Dümmer (*Gard. Chron.* p. 148; Aug. 24, 1912).—Latin diagnosis and description in English of a new species gathered by Dr. Henry in Formosa.—*E. A. B.*

Leguminosae, with Edible Tubers from Tropical Africa. By H. Harms (*Not. König. Bot. Berlin*, vol. v. No. 48, pp. 199-211; Dec. 1911; 1 page of figs.).—This paper discusses the nomenclature,

the characters, and the distribution of *Sphenostylis stenocarpa*, which previous authors had referred either to the genus *Dolichos* or *Vigna*. The plant appears to have a wide distribution over the greater part of Africa, and is often cultivated by the natives for its edible, turnip-like tubers.

Other species of the genera *Sphenostylis*, *Dolichos*, and *Vigna* are described—viz. *S. obtusifolia* (Harms) n. sp., *Dolichos Seineri* (Harms) n. sp., *Vigna Dinteri* (Harms) n. sp., *V. stenophylla* (Harms) n. sp.

Harms further mentions several species of *Eriosema* which have tuberous roots; also *Bauhinia esculenta* and *B. Bainesii* develop fleshy roots which are eaten by the natives.—*R. B.*

Leptospermum scoparium var. **Nichollii** (*Bot. Mag.* t. 8419).—New Zealand. Family *Myrtaceae*; tribe *Leptospermeae*. Shrub, 10-18 feet. Leaves lanceolate, 4 inches long; flowers solitary on lateral twigs, $\frac{2}{3}$ inch across; petals carmine.—*G. H.*

Light in Relation to Tree Growth. By Raphael Zon and Henry S. Graves (*U.S.A. Dep. Agr., Forest Service*, Bull. 92; June 30, 1911).—The light requirements of our forest trees have received but scant attention in any country. In this Bulletin the idea is to bring together the principal facts with regard to the part which light plays in the life of the forest, and the methods of measuring and recording them.—*A. D. W.*

Lilium Sargentiae. By E. H. Wilson (*Gard. Chron.* p. 385; June 15, 1912).—Description and Latin diagnosis of this new species from Szechuan, China. Allied to *L. myriophyllum*, *L. sulphureum*, and *L. Brownii*. Its large, purple bulb with acute summit forms its most marked character of distinction from these others.—*E. A. B.*

Lycium pallidum (*Bot. Mag.* t. 8440).—South U.S.A. and North Mexico. Family *Solanaceae*; tribe *Atropeae*. Shrub, 3-4 feet high. Leaves clustered, 1-1$\frac{1}{4}$ inch long; flowers solitary or in pairs; corolla tube $\frac{3}{4}$ inch; border $\frac{1}{2}$ inch across, pale greenish-yellow.—*G. H.*

Magnolia Kobus (*Bot. Mag.* t. 8428).—Japan. Family *Magnoliaceae*; tribe *Magnolieae*. Tree reaching 70-80 feet in height. Leaves obovate, 4-7 inches long; flowers 4 inches across, solitary, pure white with a purple median line outside; filaments purple.—*G. H.*

Magnolia salicifolia (*Gard. Chron.* p. 222, April 6, 1912; with fig.).—Recorded as flowering at Kew, probably for the first time out of doors in Britain.—*E. A. B.*

Mahogany, Columbian. By George B. Sudworth and Clayton D. Mell (*U.S.A. Dep. Agr., Forest Service, Circ.* 185; Aug. 3, 1911).—Columbian Mahogany, so called because it comes only from Columbia, is probably the best imitation of real mahogany that has yet been placed

on the market. Although the timbers are much alike, yet the Columbian tree does not belong to the Mahogany family at all, but to the Monkey Pod family (*Lecythidacea*). It is much valued as a furniture wood, and it is surprising that although about 40 million feet of Mahogany is sold annually, only about 18 million feet are the true Mahogany.—*A. D. W.*

Marsh Plants and Subterranean Organs. By E. E. Sherpf (*Bot. Gaz.* pp. 415-435, May 1912; 10 figs.).—The vegetation of Skokie Marsh, Glencoe, Illinois, is found to consist of three pronounced formations: Reed Swamp, with (1) *Myriophyllum-Potamogeton-Sium*, (2) Waterlily, (3) *Scirpus-Typha*, (4) *Phragmites*, and (5) *Iris-Acorus* associations.

Swamp meadow used for marsh hay and burnt in autumn with *Calamagrostis*, *Phalaris*, *Carex*, &c.; and Meadow with *Poa pratensis*, *Agrostis alba*, &c.

Weekly readings with atmometers showed reed swamp in centre, average daily evaporation 3 cc., outerpart 4.5 cc.; swamp meadow 4.27 cc.; forest (*Quercus-Fraxinus*) 7.91 cc. In the *Phragmites* zone evaporation at 1.95 metres above the soil was 7.5 cc., and 2.5 cc. at soil surface. Great variations in depth of water was found at different seasons.

The author has carefully worked out the different levels or depths at which the rhizomes in the various marsh associations are found to develop. His results are of great interest, but do not admit of being given in a short space. The rhizomes of *Nymphaea advena* are found at a depth usually at 8-25 cm. below the soil.—*G. F. S. E.*

Miltonia vexillaria Vuylstekeana optima. By G. T. Grignan (*Rev. Hort.* p. 228, May 16, 1912; coloured plate).—This beautiful orchid, raised by M. Charles Dietrich, Anderghem, near Brussels, is a cross between *M. vexillaria dulcis robusta* and *M. vexillaria Leopoldi*. The flowers, over 3 inches wide, are rich, rosy mauve, veined with deeper rose, and with an intense crimson centre of a moth-like form with divided wings; very handsome indeed.—*C. T. D.*

Mistletoe in Shensi. By F. Kingdom Ward (*Gard. Chron.* p. 147; Aug. 24, 1912; 2 figs.).—Notices the very local distribution but great abundance of three species. *Viscum album*, a large-leaved species—occurring only on willows—and an orange-berried one—a fourth species with scarlet berries, was seen but once.—*E. A. B.*

Mistletoe on Rosa canina (*Rev. Hort.* p. 49, Feb. 1, 1912).—An instance of this, presumably rare, is described as having been observed in France near Alençon.—*C. T. D.*

New Plants, Western America. By J. M. Greenman (*Bot. Gaz.* pp. 510-512, June 1912).—New species of *Castilleja* (2 sp.), *Senecio* (2 sp.).—*G. F. S. E.*

Oak, California Tanbark. Part 1 by Willis Linn Jepson, Part 2 by H. S. Betts, Appendix by C. D. Mell (*U.S.A. Dep. Agr., Forest Service, Bull.* 75; Sept. 20, 1911).—The Tanbark Oak (*Quercus densiflora*) occurs through the coast ranges from Oregon to California, and produces one of the most valuable tanning agents known for the production of heavy leather. The timber, too, is valuable, and it is suggested that there is no reason why Tanbark Oak should not take its place in the Pacific Coast hardwood market for many purposes for which Eastern hardwoods are now imported.—*A. D. W.*

Oats and Stinking Smut of Wheat and their Prevention, The Loose Smut of. By A. C. Johnson (*U.S.A. Exp. Stn., Purdue, Circ.* 22, 1910).—A general description of the two above diseases is given, and the treatment of the grain before sowing is recommended with 1 lb. formalin to 50 gallons of water, sprinkled on and shovelled over thoroughly and left for two hours in a heap.

For other loose smuts of wheat and barley the formalin, hot water, copper sulphate, and "Sar" treatments have proved ineffective, and the following modified hot-water treatment is considered to be worth a trial.

Soak wheat and barley seeds in cold water for five hours, then dip the wheat seed in hot water at a temperature of 54° C. or 129° F. for ten minutes, and barley seed in water at 52° C. or 125° F. for fifteen minutes.

Good careful directions for the carrying out of these different treatments are given.—*D. M. C.*

Oedema on Manihot. By F. A. Wolf and F. E. Lloyd (*Phytopathology*, ii. pp. 131-134; Aug. 1912; 1 plate; 1 fig.).—Ceará rubber in a greenhouse at Alahama showed "intumescences" or oedema. An account of the lesions produced is given together with a review of the literature.—*F. J. C.*

Oil-seeds, Chemistry of. By Sergius Ivanow (*Beih. Bot. Cent.* Bd. 28, Abt. i. Heft 1, pp. 159-191; 9 figs.).—The author gives tables showing the chemical composition of Rape, Hemp, Poppy, and Linseed, and traces the changes in the percentages of glucose and saccharose and of oil during the process of ripening.

He finds during the process the following:—

$$\begin{array}{c} \text{Glucose} \\ \text{(carbohydrate)} \end{array} \left\{ \begin{array}{l} \text{Glycerine} \\ \text{Saturated fatty acids—unsaturated acids} \end{array} \right\} \begin{array}{c} \text{Glyceride} \\ \text{(oil)} \end{array}$$

The vegetative parts and capsule of flax were also analysed, and the results are given.

He finds that until flowering the flax accumulates carbohydrates in the stem and afterwards in the flower, so that the assimilation organs die soon after flowering, and ripening is accomplished. Rape-seed, Hemp-seed, Sunflower-seed, and Poppy-seed were also analysed, and the chemical results are given in full.

The presence of unsaturated acids enables the seed to germinate more rapidly. With flax and colza, the testa develop first and then the cotyledons. Pentosane is found in those parts of the seed which are protective in function. It has no value or nutrition.—*G. F. S. E.*

Olearia chathamica (*Bot. Mag.* t. 8420).—Chatham Island. Family *Compositae*; tribe *Asteroïdeae*. Shrub, 3-7 feet high. Leaves oblanceolate, 2½-5 inches long; heads 2-2¼ inches wide; ray-florets pale violet-purple, disk-florets violet-purple.—*G. H.*

Ononis rotundifolia. By F. Reutersheim (*Gartenflora*, vol. lxi., pt. v., p. 124).—*Ononis rotundifolia* is more beautiful than *O. fruticosa*. It is a shrub about 20 inches in height, covered with purple flowers for several weeks in July.—*S. E. W.*

Orchid Cultivation. By A. Heydt (*Orchis*, vol. vi., pt. iii., pp. 54-56).—An important point in the cultivation of orchids is to move plants after flowering into a house at a lower temperature (10° F.) for four or six weeks.—*S. E. W.*

Orchid Culture on Fern Stems. By C. Bonstedt (*Orchis*, vol. vi., pt. i., pp. 11-15, 5 plates).—*Pleurothallis*, *Stelis*, *Octomeria*, *Masdevallia*, *Restrepia*, and other epiphytic orchids with small pseudobulbs are best grown on blocks cut from the stem of *Dicksonia* imported from Brazil. The orchids are fastened to the blocks with lead-wire, which is removed when the plant adheres. The orchids are frequently sprayed with rain-water, containing equal quantities of ammonium phosphate and saltpetre (1 in 3,000). During the period of growth the plants are dipped in a weak decoction of cowdung. In small houses the atmospheric moisture is maintained by means of trays of water in which blocks of porous sandstone stand. When the sandstone is covered with algae it is dipped in a solution of copper sulphate and dried in the sun. It may then be replaced in the trays.—*S. E. W.*

Orchids. By R. Schlechter (*Orchis*, vol. vi. pt. iv. pp. 63-69; 2 plates).—*Stelis dolichopus* is an epiphyte with a short rhizome. It has a short panicle crowded with a double row of small, yellow flowers. It is probably a native of Columbia.

S. Hennisiana, a native of Columbia, bears a large number of dark purple flowers. It requires a fibrous compost rich in Polypodium. *Dendrobium Wolterianum* from New Guinea resembles *D. capituliflorum* Rolfe in form, but is distinguished from it by the rose-red colour of its flowers.

Bulbophyllum chlorostachys, an epiphyte from Siam, resembles *B. morphologorum* in growth, but the flowers resemble those of *B. Carreyanum*, though they are larger.

Armodorum siamense is distinguished by its brown flowers; the petals and sepals have white cross bands.

Saccolabium Fuerstenbergianum, an epiphyte from Siam, closely resembles *S. trichromum*. The inflorescence consists of long-branched panicles bearing 10 to 20 red flowers, with white columns.—*S. E. W.*

Orchids from Seed, Tropical. By L. Linsbauer (*Oestr. Gart. Zeit.* vol. vii., pt. iv., pp. 117-123, and pt. v., pp. 157-166; 6 figs.).—It has been pointed out by Bernard that the seed of tropical orchids rarely germinates unless it has come in contact with the micro-organisms on the roots of the orchid. Pure cultures of these organisms can be obtained by biological methods. Six groups of mycelia are known which are capable of entering into symbiosis with the following five classes of orchids—viz., (1) *Bletilla*, *Sobralia*, *Laelia*, *Cattleya*, *Brassavola*, *Epidendrum*, *Dendrobium*, *Catasetum*, *Stanhopea*, *Gongora*, *Chysis*, *Coelogyne*, *Cymbidium*, *Angraecum*, and *Aerides*; (2) *Cypripedium*; (3) *Odontoglossum*, *Miltonia*, and *Cochlioda*; (4) *Vanda*; (5) *Lycaste* and *Anguloa*.

For horticultural purposes a mixture of sphagnum, polypodium, and osmunda is moistened with a preparation of the mycelia in sterilized pans. The orchid seed is sown on this material. Rain-water sterilized by boiling is used for watering.—*S. E. W.*

Orchids, Garden. By R. Schlechter (*Orchis*, vol. vi., pt. i., pp. 6-10).—*Laelia Johniana* is an upright epiphyte from Columbia. It is about eight inches high, and bears a greenish-white flower which is small for the species.

Eria chrysobracta from Siam is an upright epiphyte, eight inches tall, with large oval golden bracts. The flowers are snow white; the labellum has a purple margin.

Bifrenaria Pickiana is a small epiphyte from Columbia; it bears pink flowers and the labellum has a yellow margin.—*S. E. W.*

Orchids, Replanting of. By A. Heydt (*Orchis*, vol. vi., pt. ii., pp. 28, 29).—Considers it a mistake to replant orchids too frequently; once in five or six years is sufficient.—*S. E. W.*

Orchids, Replanting. By E. Elsner (*Orchis*, vol. vi., pt. iv., pp. 69, 70).—A reply to Heydt. When Osmunda fibre is used, many orchids will only need to be replanted once in three years. Terrestrial orchids, such as *Calanthe*, *Thunia*, *Pleione*, *Habenaria*, and *Disa*, must be replanted every year. *Lycaste*, *Anguloa*, *Phaius*, and *Cypripedium* are replanted every second year.—*S. E. W.*

Orchids, The Effect of Endophytic Fungi on Seed Germination of. By G. T. Grignan (*Rev. Hort.* pp. 130-2, March 16, 1912).—A reference to an interesting paper on this subject by Dr. Burgeff, of the Jena University, on the results of investigation in this direction, which demonstrate that various orchid genera have their special fungi associated with them, and that on the presence of these fungi depends successful germination. The determination of the proper species demands, however, such special knowledge and apparatus that the practical orchid-grower is debarred from personally effecting it; but this may be obviated by the fact that several botanical gardens (Jena, Leipsic, Dresden) and several specialists in Germany can supply moss

impregnated with the proper fungus spores for each genus of orchids, and thus permit of their practical introduction on proper lines.—*C. T. D.*

Oxidase-content of Plant Juices, The Measurement of the. By Herbert H. Bunzel, Ph. D. (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 238, 1912).—The main object of this Bulletin is to describe a new method for the estimation of oxidases in plant juices. The method entails the use of an elaborate thermostat apparatus, which is fully described and figured.

The practical application of the method to the study of curly-top of beets showed that the oxydase-content in the diseased leaves exhibited wide variations, and was markedly greater than in the normal leaves. The normal leaves showed a fairly constant oxidase-content.—*D. M. C.*

Palestine, New Plants from. By J. Bornmüller (*Beih. Bot. Cent.* Bd. 29, Abt. ii. Heft 1, pp. 12-15).—The author describes new species of *Glaucium* and *Salsola*. *Œnothera* "*Drummondi Hook.*" is widely spread on the dunes at Jaffa and elsewhere, and appears to be fully established. It is perennial, not annual, in Palestine.

G. F. S. E.

Panda oleosa (Pierre), **an Oily Seeded Tree of West Africa.** By A. Engler (*Not. König. Bot. Berlin*, vol. v. No. 49, pp. 274-276; June 1912; 1 page of figs.).—A full description is given of this tree which reaches a height of 10-15 metres. The seeds yield an oil which is employed for culinary purposes in South Cameroon. The tree was first found at Libreville in Gaboon by R. P. Klaine, and described by Pierre in 1896. It was named *Panda* from its local name in the Gaboon district (*m'panda*). It has also been found growing in Spanish Guinea. Zenker found it quite abundant on the shore of Lokundje, and in the evergreen rain-forests of Bipindi in South Cameroon.—*R. B.*

Panicums used for Food in Ancient Egypt. By Dr. Fritz Neolitzky (*Beih. Bot. Cent.* Bd. 29, Abt. ii. Heft 1, pp. 1-11; 2 figs.). The author examined with the microscope remnants of food found in various mummies from prehistoric Egypt. The mummies were discovered near Girga, in Upper Egypt, and are supposed to have lived between 4500 and 3000 B.C.

He finds that the seed of *Panicum colonum* was eaten, and on account of the quantity found without intermixture with other seeds considers that it was probably cultivated. There is no proof of the use of *Panicum miliaceum* or *Setaria italica*. *Panicum frumentaceum* is a species allied to *P. colonum*, not a race either of this last or of *P. Crus Galli*.

Our present cultivated plants are a selection from many once used, as, *e.g.*, *Panicum colonum*, *Digitaria sanguinalis*, *Glyceria fluitans*, *Bromus mango*, *Polygonum Convolvulus*, and *Chenopodium album*.

Cyperus esculentus was also used by the prehistoric Egyptians, and many remnants were discovered.—*G. F. S. E.*

Parasites on Leaves, Effect of. By E. S. Reynolds (*Bot. Gaz.* pp. 365-395, May 1912; 9 figs.).—Twelve species attacked by various fungi were examined and the cytology carefully investigated. The author found evidence of abnormal division of the nucleus. The composition of the cell-wall of the leaf is also altered, being browned possibly by the deposit of tannin. The chloroplasts are sometimes the first to disappear. When leaves are attacked by rust, there is hypertrophy, enlargement of the nucleus, and increase of protoplasm.

Sometimes the nuclei vanish or an unusual activity of nuclear division set in. The first reaction is sometimes the formation of a granular protoplasm. In one case the rust fungus, which was parasitized with *Darluca*, could not apparently act so vigorously on the leaf-cells, giving the host time to react to its influence.

The mode of attack seems to be through the aid of some substance injurious or stimulative to the host-cells. The host may produce a defensive toxin.—*G. F. S. E.*

Parasitism, Analysis of. By D. T. MacDougal (*Bot. Gaz.* pp. 249-260, Oct. 1911; 6 figs.).—The author found that the *Cissus* sp. was able to maintain itself when artificially grafted on *Opuntia Blakeana* and sometimes on *Echinocactus*, but soon perished on the Tree Cactus, *Carnegiea*. This last exudes an acrid fluid from fresh wounds, which are soon closed by heavy cork layers. *Opuntia versicolor* was able to maintain itself on *Carnegiea*. The expressed juices of these plants showed osmotic pressures of eleven atmospheres for *Cissus*, nine atmospheres *Opuntia Blakeana*, six atmospheres *Echinocactus*, seven atmospheres *Carnegiea*, and 12 atmospheres for *Opuntia versicolor*.

These experiments show that the direct proportions of mineral salts in the sap and its acid-contents have no direct bearing on possible parasitism.

Attempts to make beans parasitic on the joints of Prickly Pear were not successful, but four species of *Opuntia* and *Agave americana* lived two years when attached to *Carnegiea*. An *Opuntia* discovered living on *Parkinsonia* was taken off and planted. It made three new joints each from three to four times the bulk of the single joint formed yearly in the previous seven or eight years, and the spines lost their atrophied character.

Not far short of half of the living species of seed-plants use complex food material derived from other organisms by mycorrhizal or parasitic arrangements. The assumption of a mutualistic or dependent *rôle* is inevitably followed by reductions or atrophies.

Nothing as yet suggests a possible abandonment of the parasitic habit amongst plants. But in the animal kingdom the palaeozoic ancestors of the Limpet appear to have been largely parasitic on the crinoids, but are not now parasitic.—*G. F. S. E.*

Peach and Citron Pest, A (Prosayleus phytolymus) (*Agr. Gaz.* N.S.W. vol. xxiii., pt. iii., pp. 262, 263; 1 plate).—*Prosayleus*

phytolymus, a bud-eating weevil, which does much damage to orange, lemon, and peach trees, can be destroyed by spraying with arsenate of lead.—*S. E. W.*

Peach, A New Leaf Rust of. By S. Hori (*Phytopathology*, ii. pp. 143-145; Aug. 1912; 2 plates).—A new species of *Puccinia* is described on peaches in Japan and named *P. pruni-persicae*. The aecidial stage is so far unknown. No meso-spores were found as in *Puccinia pruni-spinosae*.—*F. J. C.*

Peaches. By W. J. Allen (*Agr. Gaz. N.S.W.* vol. xxiii., pt. i., pp. 65-68).—Early in the season apply to peaches, plums, and apricots 4 lb. of the following mixture to each tree: 10 lb. of sulphate of ammonia, 10 lb. of sulphate of potash, and 30 lb. of superphosphate. An orchard should be planted with more than one kind of peach.

S. E. W.

Pear, A Double-Flowering 'Beurré Naghin' (*Rev. Hort.* p. 220, May 16, 1912).—All the trees of this variety in the orchard of M. P. Passy have produced double flowers this season. The doubling is of various degrees, but practically all are affected, despite great differences in environment, nature of graft, &c. The crop, however, had not been affected.—*C. T. D.*

Pear 'Solaner.' By F. Turetschek (*Oestr. Gart. Zeit.* vol. vii., pt. vi., pp. 226-228; 1 fig.).—This pear is a local variety from North Bohemia. It succeeds best grafted on the common pear; the fruit has luscious greenish-white flesh, small core, and ripens in August.

S. E. W.

Peat-bogs (Cranberry Island) in Ohio. By Alfred Dachnowski (*Bot. Gaz.* pp. 1-33, July 1911; 7 figs.; pp. 126-150, Aug. 1911; 1 fig.).—The vegetation of Cranberry Island, in Buckeye Lake, Ohio, and its relations to the substratum temperature and evaporation are very thoroughly discussed in this important paper. The lake (south of 40° Lat.) is one of the most southerly stations of peat plants, and has been inundated by artificial dams, built in 1828 and 1832. Depths of 40 feet of peat without bottom occur in various parts of the island.

The central part of the island consists of *Sphagnum* with *Vaccinium macrocarpon* and *Rhynchospora*, *Eleocharis*, *Carex*, *Scheuchzeria*, *Eriophorum*, *Osmunda*, Sundew, and Bogbean forming a low, dense, compact growth from 6 inches to 1½ foot above the peat substratum. This is similar to plant societies in more northern regions, and probably represents an early stage in the occupation of the ground after the retreat of glacial conditions.

The border zone, forming a broken fringe round the island (and also in ponds in the Cranberry-Sphagnum zone), consists of Swamp-Loosestrife, *Decodon*, and Bulrush, with *Hibiscus*, *Sagittaria*, *Poly-*

gonum, *Scutellaria*, *Lathyrus*, *Potentilla*, *Bidens*, &c., forming a dense growth 2 to 6 feet above the substratum.

This border zone appears to be transitional to the Maple-Alder society of large-sized Maples (*Acer rubrum*), Alders, Poison Sumach, *Prunus* spp., Oaks, Ashes, and Silver Maple, the last three being rare. The tree roots do not go more than 1 foot below the surface.

The paper also contains the results of many careful researches as to the growth of plants in peaty soil. Chemical analyses of peat samples in the various zones and from other places are given. Only 8 to 12 per cent. of the nitrogen in peat seems available for plants. This available nitrogen is considerably increased when the peat is composted with the bacterial life from stable manure.

The peat soil, when exposed, was found to extract oxygen from the air with great rapidity, this reducing action being greatest in the lowest levels and in the central zone. The excessive oxygen avidity must be injurious to plants unless the latter also possess oxidizing powers or mycorrhiza, &c. The maximum amount of reduction occurs in early autumn.

The bacterial flora of the peat substratum was elaborately investigated by culture on a large variety of media. Peat soils are found to be very rich in bacteria, inducing diastatic, inverting, proteolytic, cyto-hydrolytic, and reducing action, but the organisms vary in the different substrata. Most thrive as saprophytes in the upper layers. One set of bacteria often prepares a medium for another out of an unfavourable substratum. A certain proportion of bacteria in these soils produces substances which are injurious to all but special peat-plants.

The climate is pre-eminently that of a deciduous forest, with relatively high percentage of atmospheric humidity, and with rain on 144 to 138 days. The climate does not explain the dry-climate characters of some of the peat-plants.

Records of air, water, and soil temperatures at various depths are given. The air showed a range of 59.5° C. (max. 35° C., min.—24.5° C.). The soil (1 foot depth) had a range of 27° (max. 27°, min. 0°). The soil at 5 feet depth had a range of 22.1° (max. 26°, min 3.9° C.). The substratum temperatures are not specially favourable to the preservation of bog types, and the central (xerophytic) zone is less liable to extremes of temperature than the Maple-Alder zone.

In the winter the minimum temperature of the peat substratum is considerably higher than that of the air. The shoots in July and August were in air at a temperature of 7° to 35° C., whilst the roots were at temperatures between 16° and 27° C.

The amount of evaporation was also carefully investigated. The total evaporation from May 28 to August 14 being 1,349.2 c.c. on an open lawn near the university, 933.8 in the Sphagnum-Cranberry zone, and 690.8 in the Maple-Alder zone—that is as 100, 69.2, and 51.2. The vapour blanket over the lake is more stationary in the relatively forested Maple-Alder zone.

The author concludes that the real limiting factor to the growth of other than special peat-plants is not evaporation or temperature but the poisonous nature of the substratum. The toxins produce a physiological drought, which in the case of wheat decreases the absorption of the roots by about 50 to 65 per cent.

An intimate and controlling relation exists between soil bacteria and the plants growing in the central zone.—*G. F. S. E.*

Peat-bogs in Michigan. By George Plumer Burns (*Bot. Gaz.* pp. 105-125, Aug. 1911; 8 figs.).—This is No. 8 of the author's botanical survey of the Huron River Valley, and is entitled "Edaphic Conditions in Peat-bogs of Southern Michigan." The author and others find the following characteristic zones: (1) Submerged plants to 12 feet or more in depth, *Chara*, *Ceratophyllum*, *Naias*, and *Potamogeton**; (2) Water Lily, shallow water, seldom over 5 feet; (3) Floating Sedges, the mat formed is very firm and is usually 18 inches thick (*Carex filiformis*, *Menyanthes*, *Drosera*, *Equisetum limosum*, *Scutellaria galericulata*, &c.); (4) Bog Shrubs, *Chamaedaphne*, *Andromeda polifolia*, *Betula pumila*, *Vaccinium Oxycoccos*, *Sarracenia*, &c.; (5) Tamarack, *Larix laricea*, *Osmunda regalis*, *Rhus vernix*, &c.; (6) Poplar and Maple, *Acer rubrum*, *Populus tremuloides*, *Quercus rubra*, *Solanum Dulcamara*, *Geum rivale*, *Solidago*, &c.; (7) Marginal, Willows, *Salix nigra*, *Rubus* spp., *Alisma Plantago-aquatica*, *Lycopus*, *Polygonum Hydropiper*, *Ranunculus sceleratus* (?), &c.

The temperature of the air in these bogs (at the level of the leaves) is much colder during the night and early morning than that of the surrounding upland, for cold air drains into these basins, which are low-lying, often with steep banks. But in the day-time the temperatures may be very high. This is illustrated by several tables of observations. The temperature of the soil shows, however, very slow variations during the season (except that of the uppermost layer). Thus, *e.g.*, in the last week of July the soil at 18 inches deep was only 6° C. in the Tamarack and 7.5° C. (Bog Shrub and Poplar zones), 10° C. Bogsedge.

On the other hand, at 1 inch in depth, the rise of temperature in the soil is quite rapid, and resembles that of the surrounding uplands. The variation in air temperature was sometimes as much as 25.5° C., whilst that of the soil was only about 1° C.

The level of water in the soil shows extraordinary differences according to the season, and even in the same season in different plant zones.

In Mud Lake, in consequence of a series of alternately wet and dry years, a section of the moss showed alternating layers of *Sphagnum* and *Polytrichum*.

As showing the different water-levels in different parts of the peat-moss, the water-table was 18.4 inches below the surface in the

* A few of the British species in each formation are quoted here.

Maple-Poplar zone, but in the Tamarack 12.4 inches, and in the Bog Shrub 6.8 inches.

So, as it is only in the superficial layers of soil that peat-plants develop their roots, the lowering of the water-table may have very important results.

Observations were also taken of humidity and light in various parts of the peat-bog.

There is also an important discussion in the paper as to what exactly causes the dry-climate characters of many peat-plants. The author agrees with Davis in believing that this is mainly due to the drying of the surface layer and the ability of peat to hold large amounts of water which cannot be drawn off by plants. At the same time, the alleged poisonous character of the soil substratum in bogs would result in toxins of the bog-water reaching the roots as soon as the superficial layer becomes dried by evaporation.—*G. F. S. E.*

Peat Moss, Manurial Value of. By H. von Feilitzen (*Gard. Chron.* p. 404; June 22, 1912).—Written to combat an unfavourable report on this manure in *Journal of the Board of Agriculture*, Dec. 1911. The writer thinks the ill-results obtained at Kew must have been due to other causes than the use of peat moss.—*E. A. B.*

Pelargonium zonale 'Le Poitou.' By Viaud Bruant (*Rev. Hort.* p. 304, July 1, 1912; coloured plate).—The plate represents, somewhat reduced, a very beautifully tinted umbel of well-formed and large flowers of the 'Bruant' (Poitiers) strain. Described as having the three inferior petals brilliant violet margined with red, and the upper ones red and violet, freely spotted with red, from which, however, the illustration differed largely. In it the flowers are a warm magenta, slightly suffused with violet, the centre deep orange with radiating red streaks.—*C. T. D.*

Penetration of Inorganic Salts in Treated Wood, A Visual Method for Determining the. By E. Bateman (*U.S.A. Dep. Agr., Forest Service, Circ.* 190; Nov. 9, 1911).—An interesting account of tests that have been made for determining the depth of penetration which has been attained by zinc chloride or other salts.—*A. D. W.*

Perovskia atriplicifolia (*Bot. Mag.* t. 8441).—Afghanistan to Western Tibet. Family *Labiatae*; tribe *Monardeae*. Shrub, 3-5 feet high. Leaves ovate-lanceolate, $1\frac{1}{2}$-$2\frac{1}{4}$ inches long; inflorescence paniculate; corolla blue.—*G. H.*

Perovskia atriplicifolia. By R. W. (*Oestr. Gart. Zeit.*, vol. vii. pt. v., pp. 186-187).—*Perovskia atriplicifolia* is a shrub attaining a height of five feet, found in Afghanistan and the Western Himalaya. Its leaves are covered with down. The numerous flowers are blue-violet with white throat.—*S. E. W.*

Pine in the Southern States, Cause, Extent, and Remedy, The Dying of. By A. D. Hopkins (*U.S.A. Dep. Agr., Farmers'*

Bull. 476; Dec. 26, 1911).—Of late years the killing out of Pine trees in the Southern Atlantic and Gulf States, principally by insect pests, has attracted general attention.

Descriptions of the various insects and best methods for combating these pests are included in this paper.—*A. D. W.*

Pine Trees, Weevil Destructive to. By W. W. Frogatt (*Agr. Gaz. N.S.W.* vol. xxiii., pt. i., pp. 55-56; 1 plate).—The weevil (*Aesiotes leucurus*) deposits its eggs on the bark of pine trees; the grubs feed between it and the sap wood, doing great damage. The weevil, cocoon, pupa, and larva are depicted in the plate.—*S. E. W.*

Pine, Western Yellow, in Arizona and New Mexico. By Theodore S. Woolsey, jun. (*U.S.A. Dep. Agr., Forest Service, Bull.* 101; Nov. 24, 1911).—By far the greater part of the lumber exported from Arizona is that of the Western Yellow Pine (*Pinus ponderosa*), a tree of which there are casual good specimens to be found throughout the British Isles, where, however, it does not thrive sufficiently well to be worthy of using for afforesting purposes. Although the tree does not reach the size attained on the Pacific Coast, yet it is well suited for the arid soils of Arizona, and produces large quantities of valuable timber.—*A. D. W.*

Plantago, New Species of the Sections Cleiosantha and Novorbis. By R. Pilger (*Not. König. Bot. Berlin*, vol. v. No. 49, pp. 259-263; June 1912).—Ten new species of Plantago are described —viz. *P. accrescens* from the Argentine, *P. alismatifolia* from Mexico, *P. subnuda* from California, *P. hypolasia* from Uruguay, *P. Kurtzii* from the Argentine, *P. nigritella* from the Argentine, *P. Pflanzii* from Bolivia, *P. refracta* from Patagonia, *P. Rojasii* from Paraguay, *P. Stuckertii* from the Argentine, and *P. Stuckertii* sub.-sp. *catamarcensis* from the Argentine.—*R. B.*

Plant Diseases in Connecticut. G. P. Clinton, Sc.D. (*U.S.A. Exp. Stn., Conn., Rep.*, 1909-1910).—This report includes notes on plant diseases in Connecticut, spraying experiments on potatos in dry seasons, and a description of experiments in which the author claims to have found oospores of *Phytophthora infestans* when grown in artificial media, and also to have obtained hybrids of *P. infestans* with *P. cactorum*, and also with *P. phaseoli*.

He was unable, however, to obtain oospores of *Phytophthora infestans* when grown on culture media of potato juice agar.

D. M. C.

Poisonous Sumachs (*Oestr. Gart. Zeit.*, vol. vii., pt. i., pp. 15-19).—Examples are given of the poisonous action of *Rhus Toxicodendron*, *R. vernicifera*, and *R. atrum*. When a rash is produced by coming in contact with these shrubs, apply a solution of lead acetate or potassium carbonate, tincture of *Sanguinaria canadensis*, or *Grindelia robusta* to the parts affected.—*S. E. W.*

Poles, Preservative Treatment of. By William H. Kempfer (*U.S.A. Dep. Agr., Forest Service, Bull.* 84; June 12, 1911).—Several years ago the Forest Service undertook a number of experiments with a view to prolonging the life of poles, and the result of these investigations, which are so far most successful, is given in the above paper.

Some of the systems adopted have been successfully carried out in this country for several years back.—*A. D. W.*

Potato, After-ripening of the. By Charles O. Appleman (*Bot. Gaz.* pp. 306-315, Oct. 1911).—The following table summarizes the results obtained by the author:—

Exposure in days	Temperature in 0°C.	Glucose Per cent.	Sucrose Per cent.	Starch Per cent.	Diastase (see below)	Catalase (see below)	Peroxidase (see below)
14 . .	20–25	·37	0·55	14·4	30	40·6	35
	0–1	·52	1·3	13·2	25	37·6	35
28 . .	20–25	·32	0·54	14	30	41·2	33
	0–1	1·8	1·65	11	20	28·6	32
42 . .	20–25	·3	0·84	13·6	25	44	32
	0–1	3·5	1·8	9·6	20	26·4	25

The unit in the diastase column was the number of c.c. potato extract required to digest 100 c.c. starch solution in twenty-four hours at 48° C. The catalase unit was the number of c.c. of O_2 evolved in three minutes. The unit in the peroxidase column was the number of seconds required to reach standard colour. There is a long discussion as to the best methods of estimating peroxidase.

The rest period of potatos is shortened by a temperature of 0° C., but there was no appreciable difference in the diastase activity at the end of six weeks, as the variety of potato used was then nearly at the termination of its period of rest.

The behaviour of catalase corresponds with that of respiration under similar conditions.—*G. F. S. E.*

Potato Scab. By W. J. Morse (*Phytopathology*, ii. pp. 146-149; Aug. 1912; figs.).—The author concludes as a result of experiment that the germs of the potato scab organism (*Oospora scabies*) are able to pass through the digestive tract of the horse and cow, and pass into the manure without injury, but more readily in the case of the former. This manure is thus a source of infection when the animals are fed with scabby potatos.—*F. J. C.*

Potato, The Fusarium Blight or Dry Rot of the. By Thos. F. Manns (*U.S.A. Exp. Stn. Ohio, Bull.* 229, 1911).—The writer is emphatic on the point that all potato growers should know the early symptoms of the disease, so as to be able to recognize them in the tubers before planting, and thus to a large extent prevent further infection of the soil. The chief symptoms in the tuber range from slight discoloration of the flesh at the stem end to darkening and

blackening of the vascular tissue to a depth of about $\frac{1}{2}$ inch, which later may spread throughout the tuber. In some cases the discoloration appears in patches, and these patches should be cut out of the seed tubers before planting. Badly discoloured tubers should never be used for seed.

The symptoms in the field are slow early growth, apparent cessation of growth when plants are from 10-15 inches high, accompanied by general yellowing of the foliage, the inward rolling of the leaves, and general wilting on the first hot days, and the early maturity of the plant, which finally turns yellow and dies, but the stem remains as a rule erect.

On cutting across the stem and roots the vascular system shows discoloration.

Two other potato diseases are mentioned with which the *Fusarium* blight may be confused, namely (i) Internal blotch causing rusty, irregularly distributed blotches in the flesh of the tubers, but no external symptoms. No organism has as yet been found causing this blotch.

(ii) Black-leg—a bacterial disease of stem and root.

Blackened lesions appear on the stem, and the rapid decay of the shanks causes wilt. But it may be distinguished from *Fusarium* by the absence of the characteristic yellowing of the foliage which always occurs in cases of dry rot.

The remedies suggested are:

1. Sowing *Fusarium*-sick soil with grain or grass and not growing potatos on that soil for at least six years.

2. *Seed treatment* (a) by dipping for 1-2 hours in solution of 1 lb. of commercial 40 per cent. formalin to 30 gallons of water. (*b*) Fumigation of seed with 3 lb. formalin; 23 oz. potassium permanganate.

The above quantity is enough to treat 1000 cubic feet of space occupied by crates and trays.

3. The cutting away of diseased patches from seed tubers.

4. Careful destruction of diseased branches and refuse.

Good plates are given.—*D. M. C.*

Prairie Grove, An Isolated. By H. A. Gleason (*Bot. Gaz.* pp. 38-49, Jan. 1912; 2 figs.).—This isolated wood, Bur Oak Grove, is near the village of Royal in Champaign county, Central Illinois. It is surrounded on all sides by level prairie, but covers a number of elevations and depressions of irregular shape and about ten feet in depth. Near the south end of the grove the forest is open with "blue grass," and consists chiefly of *Quercus imbricaria*, *Q. velutina* and *Carya* spp. In the middle of the grove *Q. macrocarpa* (some trees three to four feet in diameter) is most important, with *Juglans*, *Ulmus*, *Celtis*, *Gleditschia triacanthos*, &c. In the northern end *Q. rubra* and *Tilia americana* appear. Here also there is a conspicuous deposit of leaf-mould, and a denser shade with an abundant herbaceous vegetation.

The forest occurs only on the ridges and at about two feet above the former maximum level of standing water in the depressions (these

are usually now drained and pastured). Blue grass forms a zone from the forest to the former level of standing water. Then follows *Ambrosia*, *Eupatorium*, *Bidens*, *Polygonum acre*, *Verbena* (selected through pasturing?), and in the wettest places *Iris*, *Mimulus*, and *Scirpus*.

The succession of Oak-Hickory, Bur Oak, and Red Oak is usual in Central Illinois, and is caused by accumulation of humus and increasing shade.

The forest is considered to have reached the locality by immigration from the moraine to the north-east, which was once forest-clad. The forest has been removed by prairie fires, except where protected, as at Bur Oak Grove, by depressions or sloughs in which standing water used to accumulate.—*G. F. S. E.*

Prickly Pears. By J. H. Maiden (*Agr. Gaz. N.S.W.* vol. xxiii. pt. iii., pp. 208-290; 2 plates).—*Opuntia nigricans*, frequently called *O. Tuna*, is legislated against in New South Wales. It is 6 to 10 feet high with spines 2¼ inches long. The flowers vary in colour from yellow to orange and pink. The pyriform fruit is carmine in colour.
S. E. W.

Provence, Forests of. By A. G. Tansley (*Gard. Chron.* pp. 89, 112, 131; Aug. 3, 10, 17, 1912; 7 figs.).—Treats of (1) The Mediterranean coniferous forests; (2) the deciduous woods of the "Montane" region; (3) montane and sub-alpine coniferous forests.—*E. A. B.*

Pseuderanthemum lilacinum (*Bot. Mag.* t. 8446).—Malay Peninsula. Family *Acanthaceae*. Shrub, 3 feet high. Leaves lanceolate, 4½-10 inches; inflorescence paniculate; corolla tube slender, 1½ inch long; lobes 1½ inch across; pale lilac with red specks on the mid-lobe of the lower three.—*G. H.*

Puccinia graminis. By Frederick J. Pritchard (*Bot. Gaz.* pp. 169-192, Sept. 1911; 1 plate).—This is a preliminary report on the yearly origin and dissemination of *Puccinia graminis*. The author gives a brief historical resumé, and describes a number of inoculation and other experiments. He considers that there are three distinct biologic forms—that of wheat, that of barley, and a third affecting oats, *Avena fatua*, rye, *Hordeum jubatum*, and two species of *Agropyrum*. The barberry was as easily infected by the *Puccinia* from wheat as from *Agropyrum*, *Hordeum*, and *Elymus*. Aecidiospores were not carried by wind for more than 100 yards, and few seemed to travel 80 yards.

Puccinia does not seem to spread to wheat by aid of the grasses. Near the barberries, Uredo appeared on the winter wheat quite as soon as upon the grasses near barberry bushes, and away from these bushes, with one exception, it was generally present on spring wheat before it appeared in grass. Uredospores failed to survive the winter at Fargo, Dakota.

The uredo appears late in spring, and rusted grasses do not produce the uredo again after being housed during the winter. The wintering of *P. graminis* as mycelium in the tissues is considered very doubtful.

The pericarp of rusted wheat grains is frequently filled with rust mycelium and numerous pustules of teleutospores. Pieces of mycelium resembling rust were found in the cells of the scutellum close to the growing plant. Teleutospores in some of the germinating grains appeared to be germinating in a palmella stage.

There are many other points of great practical importance in this paper.—*G. F. S. E.*

Rhodochytrium. By Robert F. Griggs (*Bot. Gaz.* pp. 127-173, Feb. 1912; 6 plates).—The author gives a very full description of the cytology and life-history of this parasite.

It seems to be transitional between protoccoid algae and certain fungi. He finds a close relationship to the algae through *Phyllobium*, and in cell division, &c., it resembles *Synchytrium*. No morphological difference was found between the three races of this plant, though they are geographically isolated and attached to different hosts.—*G. F. S. E.*

Rhododendron Augustinii and R. Fargesii. By C. P. Raffill (*Gard. Chron.* p. 4; July 6, 1912).—Figures and descriptions of these two newly introduced Chinese species.—*E. A. B.*

Romneya Coulteri. I. By P. Lécolier. II. By J. Gérôme (*Le Jard.* xxv. 592, p. 305, Oct. 20, 1911; 4 figs.).—A general article on the *Romneya*, pointing out that it thrives well in dry seasons and needs little watering. It is also more hardy than is commonly supposed, and requires only slight if any protection in the winter. Its utility as a cut flower is also emphasized, as it lasts well in water.—*E. A. W.*

Rootcap, Types of. By Günther H. Krole, Berlin (*Beih. Bot. Cent.* Bd. 28, Abt. i. Heft 1, pp. 134-158).—The author describes and analyses the various methods of rootcap-formation given by previous authors, and gives a systematically arranged list of 571 species in which the initial layers and their origin have been observed.

A single (or several in Marattiaceae) three-sided initial cell characterizes most Ferns and Marsilia. Three-sided initial cell (with plerome, periblem, epidermis) is found in *Equisetum*, one initial cell (with plerome, periblem, dermatogen, and calyptrogen) which is four-sided in *Lycopodium* and two-sided in *Isoetes*. *Selaginella* also has one or several two-sided initial cells.

The *Gymnosperms* have plerome and periblem, which last forms the rootcap and epidermis.

Dicotyledons.—Most possess plerome, periblem, and dermatogen; the latter forms the rootcap. Others, however, have plerome and common initials for the other tissues. Others, again (*Myrica*, Ranun-

culaceae, &c.) have a common indistinguishable meristem. In Amentaceae, Proteaceae, Casuarineae, and some Leguminosae there is plerome, periblem, and epidermis, periblem forming the rootcap.

Monocotyledons.—In a few (*Hydrocharis*, *Pistia*) there are all four layers. In others (*Alisma*, &c.) the rootcap is formed by a calyptrogen arising from the dermatogen.

In others there is only plerome and common initials for the other tissues.

In *Viscum* there is no special histogenous layer, and *Cuscuta* has initial cells which act like apical cells.

The author points out that the rootcap layers can have no value in classification.—*G. F. S. E.*

Rose Black Mildew (Peronospora sparsa). By A. Bretschneider (*Oestr. Gart. Zeit.* vol. vii., pt. vi., pp. 223-226).—Spraying with Bordeaux mixture marks the leaves of the roses; copper soda mixture has not this disadvantage. The copper soda mixture must not be acid; if it turns litmus paper red, more carbonate of soda must be added. "Tenax" and "Cucasa" are also effective; the latter does less damage to the foliage than any other preparation. The disease may be arrested, but cannot be cured by these means. Healthy roses can be protected by spraying with these copper preparations.—*S. E. W.*

Rupicola sprengelioides (*Bot. Mag.* t. 8438).—Australia. Family *Epacridaceae*; tribe *Epacrideae*. Shrub, 2½ feet high. Leaves linear-lanceolate; flowers white.—*G. H.*

Rusts in the United States, Timothy. By Edward C. Johnson (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 224, 1911).—Timothy Rust is very similar in general appearance to *Puccinia graminis* in wheat. It attacks both leaf and stem, forming long yellowish-brown uredo pustules, and dark brown to black teleuto pustules, which rupture the epidermis. The aecidial stage is not known.

The rust can be easily transferred to *Avena sativa* and a number of grasses, but cannot directly infect *Triticum vulgare*. By the use of bridging species the rust undoubtedly could be made to transfer to many grasses on which it would not grow when coming directly from timothy, and by means of *Festuca elatior* the rust was transferred to *Triticum vulgare*. The author points out that Timothy Rust is spreading in the States, and that steps should be taken for its control, the only method being to raise resistant varieties. This work has been begun.

D. M. C.

Rusts of Grains in the United States. By E. M. Freeman and Edward C. Johnson (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 216, 1911).—The rusts of so-called small grain crops are amongst the most serious diseases of plants. This Bulletin represents an attempt on the part of the authors to show briefly our present knowledge of rusts in U.S.A. in comparison with our knowledge of rusts in Europe.

The botanical characteristics, life histories, and physiological specialization of parasitic fungi vary with the geographical distribution, and investigations on rusts by European botanists cannot be accepted as final in America. The rusts are divided into stem and leaf rusts, the stem rusts being of the most importance economically; some of the leaf rusts do not cause much damage.

The distribution of rusts in the United States is carefully worked out. In districts where the annual rainfall is below twenty inches the rusts are generally of little importance. Spraying experiments and soil treatment for the prevention and control of rust proved to be useless from a practical point of view.

In 1907 and onwards the authors undertook extensive continuous cultural experiments to determine the vitality of successive *Uredo* generations of various grain rusts. Summaries of the results are given in a number of tables, and the experiments showed that for fifty-two generations there was no apparent diminution of vitality.

All the recent work on the breeding of immune varieties is summarized, and a comprehensive bibliography given at the end of the Bulletin.—*D. M. C.*

Salvinia, Development of. By Sigismund Zawilski (*Beih. Bot. Cent.* Bd. 28, Abt. i. Heft 1, pp. 17-65; 91 figs.).—This paper gives a complete description of the whole anatomy and development of *Salvinia,* and is very fully illustrated.—*G. F. S. E.*

Sap Stain in Lumber, The Prevention of. By Howard F. Weiss and Charles T. Barnum (*U.S.A. Dep. Agr., Forest Service, Circ.* 192; Nov. 23, 1911).—Experiments on a large scale have been conducted in the United States as to the cause and prevention of sap stain in timber.

The nine conclusions arrived at are most valuable to the wood merchant, the best results having followed the use of mercuric chloride solutions when applied to the timber soon after felling.

A. D. W.

Saxifraga lingulata (*Bot. Mag.* t. 8434).—Maritime Alps. Family *Saxifragaceae*; tribe *Saxifrageae.* Herb, with a rosulate crown and a central flowering stem. Leaves linear, 1-5 inches long, red near the base and with numerous marginal pits loaded with chalk; peduncle many-flowered; flowering stem 2-5 inches long; flower $1\frac{1}{2}$ inch across; petals white.—*G. H.*

Schomburgkia Lueddemani (*Bot. Mag.* t. 8427).—Venezuela. Family *Orchidaceae*; tribe *Epidendreae.* Herb; epiphytic. Pseudobulbs 6-10 inches long; leaves 8-14 inches long; scape $1\frac{1}{2}$-2 feet long; flowers 3 inches across from tips of sepals; sepals and petals $\frac{1}{4}$ inch broad, brown with purple lip and column.—*G. H.*

Scrub Pine. By W. D. Sterrett (*U.S.A. Dep. Agr., Forest Service, Bull.* 94; July 22, 1911).—Botanically known as *Pinus virginiana,*

the Scrub Pine is one of the most useful of its family for planting on waste poor lands where few other trees could succeed. The timber is of little value, commercially speaking, and although used for railway and other purposes, the principal use is as fuel. For charcoal and pulpwood it is also in use.—*A. D. W.*

Sedum, Description of a New, from Mexico. By Raymond Hamet (*Not. König. Bot. Berlin*, vol. v. No. 49, pp. 277-278; June 1912).—A detailed description in Latin of this new perennial species of Sedum, which is named *Sedum Adolphi.* The specimens described were grown in the Dahlem Botanic Garden from seed sent by Purpus from Mexico. This species, although very closely allied to *S. allantoide* and *S. Treleasei* described by J. N. Rose, is yet quite distinct from these.—*R. B.*

Seed and Size of Fruit. By T. A. Harris (*Bot. Gaz.* pp. 396-414, May 1912; 1 fig.).—The author has carried out a laborious biometrical research on the number of ovules, of seeds, and the size of fruit of *Staphylea.* Pollination is a stimulus to the development of the ovary. The coefficients of correlation show that there is a very substantial interdependence between the number of seeds and fruit length in both *Cercis* and *Staphylea.* He finds by biometrical investigation no relationship between the number of ripe seeds and number of ovules, nor between length of pod and number of ovules. Nor is a mechanical stretching of the pod apparently admissible. The correlations of length of pod and number of seeds with number of fruits on an inflorescence or with position of pod on inflorescence are slight.

One cannot explain the correlation (length pod with number of seeds) by favourable nutrition or innate vigour—*i.e.* by the individuality of the plant.

He therefore concludes that in both *Cercis* and *Staphylea* the length of the fruit is an effect of the number of seeds.—*G. F. S. E.*

Seed Development. By T. A. Harris (*Beih. Bot. Cent.* Bd. 28, Abt. i. Heft 1, pp. 1-16; 1 fig.).—The author has examined over 8000 fruits of *Staphylea trifolia*, and in this paper gives biometrical tables regarding number of pods to each inflorescence, number of ovules in each loculus of ovary, number of ripe seeds in each loculus. He also examines the effect of the position of pod on the inflorescence in bringing about a greater or less number of ripe seed.

He finds that so far as this research is concerned, the relative, as well as the actual, number of seeds developing seems to be very little dependent upon either position of the inflorescence or number of fruits developing in each inflorescence.

There is a slight *negative* correlation for number of fruits and number of seeds developing, but position on the inflorescence seems to have no sensible influence on the capacity of the fruit for maturing its seeds.

Fertility and fecundity are not always so easily influenced by the

character of the inflorescence or by the position of the fruit on the inflorescence as might have been, a priori, expected. The author gives twelve tables, 2 correlation tables, and has apparently counted 189,923 ovules and 19,827 seeds.—*G. F. S. E.*

Seed Production in Western Yellow Pine, The Influence of Age and Condition of the Tree upon. By G. A. Pearson (*U.S.A. Dep. Agr., Forest Service, Circ.* 196; Jan. 13, 1912).—The conditions affecting the germinative quality of seed of the Yellow Pine are fully discussed in this paper, and are of particular interest to the nurseryman or others who raise trees from seed.

Seed from young trees show a higher germination than seed from old, mature, or over-mature trees.—*A. D. W.*

Seeds, Longevity of (*Rev. Hort.* p. 170, April 16, 1912).—Seeds of *Acacia lophantha* sown by Sir William Herschel, and which had been sent to him by his father in 1843, germinated and produced seven plants, of which one has flowered abundantly. The seeds were thus sixty-eight years old when sown.—*C. T. D.*

Sex Inheritance in Lychnis. By G. H. Shull (*Bot. Gaz.* pp. 329-368, Nov. 1911; 15 figs.).—The author used fourteen hermaphrodite individuals of *Lychnis dioica* for Mendelian experiments. He found that some of these behaved exactly like normal males, whilst others, when used as pollen parents, produced hermaphrodite and not male offspring, and describes the first set as "somatic" and the second as "genetic." The results of his experiments were as follows:

1. Genetic hermaphrodite mutants with females produced 586 female, 446 hermaphrodite, and 2 male.
2. Genetic hermaphrodite mutants self-fertilized, 143 ♀, 120 ☿.
3. Hermaphrodites formed in second series and self-fertilized, 147 ♀, 101 ☿, 3 ♂.
4. Crossing hermaphrodites from second series with an unrelated female 1382 ♀, 867 ☿, 3 ♂.
5. Crossing females of second series with unrelated male, 471 ♀, 305 ♂, 4 ☿.
6. Daughters of a self-fertilized hermaphrodite crossed with one of their hemaphrodite "sibs," 429 ♀, 155 ☿.
7. Hermaphrodite offspring of an outcrossed hermaphrodite mutant crossed with unrelated females, 428 ♀, 292 ☿, 1 ♂.
8. Hermaphrodites pollinated by normal males, 29 ♀, 12 ♂, 2 ☿.
9. Hermaphrodite offspring of a hermaphrodite mother and normal male crossed upon unrelated female, 89 ♀, 71 ☿.
10. The same crossed with "sibs" (females of their own descent), 127 ♀, 73 ☿, 2 ♂.
11. Daughters of a hermaphrodite mother and male father crossed with unrelated male, 50 ♀, 34 ♂.
12. Male mutants crossed with unrelated females, 83 ♀, 84 ♂.

13. "Somatic" hermaphrodites crossed with unrelated females, 184 ♀, 133 ♂.

The author concludes that these hermaphrodites are modified males. Somatic hermaphrodites may be externally indistinguishable from genetic, but produce only male or female plants. The hermaphrodite character can neither find expression in the females nor be transmitted by their eggs to the male offspring. The eleven males found (in 5467) proved to be normal. The author considers that "the sexes represent alternatives which in different species may be attained in various ways through either quantitative or qualitative changes, additions, subtractions, substitutions, or transformations, and that in some instances the action of the environment may prove effective in determining which of these states shall find expression. Nearly all the recent investigations indicate, however, that sex is at least predominantly dependent upon the genotypic nature of the individual."

G. F. S. E.

Spondianthus, On the Systematic Position of the Genus. By A. Engler (*Not. König. Bot. Berlin*, vol. v. No. 48, pp. 240-243; Dec. 1911).—It was previously believed that this genus could not be included among the Euphorbiaceae since it was thought to possess resin passages protected by bast in the cortex. Engler now finds that these "resin passages" are not really of this nature but are laticiferous vessels. Moreover the pistil is surmounted, when ripe, by six stigmas (not five as was formerly believed). This genus must, therefore, be included among the Euphorbiaceae.—*R. B.*

Stanhopea peruviana (*Bot. Mag.* t. 8417).—Peru. Family *Orchidaceae*; tribe *Vandeae*. Herb. Leaves one to each pseudobulb, 10-14 inches long, 6½ inches broad; scape pendulous, many-flowered, 10 inches long; flowers showy, golden-yellow spotted with purple; whole flowers 2½ inches long, 1½ inch broad.—*G. H.*

Stranvaesia undulata (*Bot. Mag.* t. 8418).—China. Family *Rosaceae*; tribe *Pomeae*. Shrub or tree, 30 feet high. Leaves 1½-4 inches long; corymbs, leafy below; flowers about thirty, ½ inch across, white; anthers purple; petals soon falling; fruit orange, ¼ inch in diameter.—*G. H.*

Styrax Wilsonii (*Bot. Mag.* t. 8444).—China. Family *Styraceae*. Shrub. Leaves elliptic-ovate; flowers in axillary and terminal short racemes; corolla white, ¾ inch across.—*G. H.*

Sweet Pea Disease, A Further Study of Some Gloeosporiums and their Relation to a. By J. J. Taubenhaus (*Phytopathology*, ii. pp. 153-169; Aug. 1912; 1 plate, 1 fig.).—The anthracnose of sweet peas has already been shown to be due to *Glomerella rufomaculans* (See JOURNAL R.H.S. xxxviii. p. 179). Further experiments have been carried out which the author considers establish the identity of *Gloeosporium gallarum* Ch. Rich., *G. diospyri* E. & E., *G. officinale*

E. & E., *Gloeosporium* sp. from May-apple fruit, *Colletotrichum nigrum* E. & H. and *C. phomoides* (Sacc.) Chest., with that fungus. *Glomerella gossypii* readily infects sweet pea but will not infect the immature apple. It would appear to be a physiological race of *Glomerella rufomaculans*. *Colletotrichum gloeosporioides* Penz., *Gloeosporium* sp. from *Populus deltoides*, *G. musarum* and *C. lagenarium* (Pass.) E. & H. do not infect apples or sweet peas even after puncture inoculations. They therefore appear to be distinct species.—*F. J. C.*

Syringa Julianae (*Bot. Mag.* t. 8423).—China. Family *Oleaceae*; tribe *Syringeae*. Shrub, 3-4 feet high. Leaves ovate-elliptic; inflorescence terminal, 2 inches in length; flowers white and lilac-purple, 3-4 lin. long.—*G. H.*

Temperature Apparatus, An Electrical Constant. By W. G. J. Land (*Bot. Gaz.* pp. 391-399, Nov. 1911; 4 figs.).—The author figures and describes an apparatus which will maintain a definite constant temperature within very narrow limits for weeks at a time. It is automatic, uses a minimum quantity of electricity, and should cost about 15 dollars, or can be constructed for 3.75 dollars. The thermostat is a strip of iron riveted to a strip of zinc. The free end is in contact with a platinum-tipped adjusting screw. The heater is a water-jacketed resistance coil of brass tubing and German-silver resistance wire.

The rise of temperature in the oven above a certain point is made to open the switch by the separation of screw and strip of the thermostat. When the temperature falls the strip again touches the screw.
G. F. S. E.

Tendrils, Breaking Strength of. By W. D. Brush (*Bot. Gaz.* pp. 453-477, June 1912; 3 figs.).—The author found that tendrils exposed to tension, and also having formed contact with a support, had a much higher breaking strength (1007 grams average), as compared with tendrils in contact only (651 gr.) and free tendrils (190 gr.). Tension certainly increases strength of tendrils sometimes by as much as 50 per cent. in the middle third of its length. By radial pressure (obtained by a mercury column in an indiarubber tube enclosed by the tendril), an increased breaking strength was obtained (990 grams as compared with 727 gr.). Contact, pressure, and tension, all increase the breaking strength.

The anatomical part of the paper shows that in passion flower tendrils the cells of the xylem are increased both in number and thickness by contact, and the walls of the pith are much thickened in consequence of tension. Tension acts as a stimulus perhaps by increased hydrostatic pressure, perhaps by stimulation of the cell membrane, if such membrane exists.—*G. F. S. E.*

Timbers, Structural, Strength Values for. By McGarvey Cline (*U.S.A. Dep. Agr., Forest Service, Circ.* 189; Jan. 25, 1912).

This includes the result of a number of tests that have been made to determine the strength values of various timbers for structural purposes.—*A. D. W.*

Tobacco, Cuban. By Heinrich Hasselbring (*Bot. Gaz.* pp. 113-126, Feb. 1912; 6 plates).—The author found that the tobacco fields in Western Cuba show a lack of uniformity. There is a great variety of forms, and it is impossible to group all the plants in fixed categories. The chief difficulty of cultivation appears to arise from the soil being so thoroughly infected with fungi that rain during the growing season destroys all the plants in the seed-beds. The young plants are therefore largely grown in the mountains in soil which is partly sterilized by burning brush on the surface. Some growers depend on purchase for their young plants. No seed selection is practised. After the stems have been cut off, suckers are formed from the roots, and it is these suckers which furnish the seed. The ground is no longer irrigated when the plants have been cut, and these suckers are much choked with weeds.

Hence the seed is a mixture, and there is no pure breeding. The plants are usually self-pollinated. The author selected fourteen plants in Cuba, and sowed the seed obtained from them. He did not find that there was any great variation in the progeny of any one plant. They differed from the Cuban original, but were uniform in themselves. The descendants of each plant were like it.

The author found no "breaking up of the type" due to a new environment.—*G. F. S. E.*

Tomato, A New, 'Directeur Plateau.' By E. Plateau (*Rev. Hort.* pp. 107-8, March 1, 1912; one illustration).—This Tomato is described as producing twin bunches of fruit, brick-red and of such a size that a plant yielding six of such twin bunches bears as much as 18 lb. of fruit of fine quality. The plant grows about 4 feet high.

C. T. D.

Tomato Blight and Rot in Virginia. By H. S. Reed (*U.S.A. Agr. Exp. Stn., Virginia, Bull.* 192, April 1911).—Tomato Blight is due to *Septoria Lycopersici*, and the Tomato Rot to *Phytophthora*, two distinct fungoid diseases, which often occur together on the same plant.

The *Septoria* blight attacks the leaves only, causing small spots which enlarge rapidly and destroy the leaves. The leaves become brown and droop from the base of the petiole. The dead leaves hang on till disjointed by the wind, &c. The spores are borne in pycnidia formed in the spots on the older leaves. Favourable conditions for the spread and development of the disease are warm, rainy weather. Long spells of dry, hot weather tend to check the disease. The spores are slightly curved, and many septate.

The tomato *Phytophthora* is the more destructive of the two diseases. The fungus attacks leaves, stem, and fruit. The leaves

and stem turn black, and look as if they had been cut by frost, and the fruit turns black at the stem end. The plant succumbs rapidly, and white tufts of conidiophores appear on the under surface of the leaves, on the stem, and in the furrow round the fruit stalk. Unless associated with other organisms the *Phytophthora* does not produce wet rot in the fruit.

The above diseases are controlled by spraying with Bordeaux and lime-sulphur washes.—*D. M. C.*

Transpiration and Light Intensity. By B. E. Livingstone (*Bot. Gaz.* pp. 417-438, Dec. 1911; 1 fig.).—In order to test the various methods of recording transpiration, the author compared the actual amount of water transpired (under given light conditions) by three plants—*Physalis*, *Xanthium*, and *Martynia*—with the results as shown by Hicks' solar radio-integrator, three porous cup atmometers (brown, white, and black), a black bulb thermometer in vacuo (Kny Scheerer), Wynne's exposure meter with standardized paper, and Clements' actinometer with solio paper.

Graphs are given showing the records obtained by these various instruments, and by the living plants under same conditions of exposure; coefficients of correction are also calculated.

The author concludes that, on the whole, the black and brown atmometers and the Hicks' integrator are valuable instruments for estimating solar intensity so far as transpiration is concerned. The black bulb thermometer recommends itself as the best of the non-integrating devices. The photographic papers may be valuable when the effects of light variations on photo-synthesis, rather than on transpiration, are to be determined.—*G. F. S. E.*

Transpiration, Variations in. By B. E. Livingstone and W. H. Brown (*Bot. Gaz.* pp. 309-330, April 1912).—The authors collected once every hour or every two hours a large number of similar leaves from plants growing in the open. These were immediately placed in stoppered bottles, and the moisture contents calculated by the dry weight obtained.

The authors found, at least frequently, a marked decrease of moisture in the leaf during the day, and a corresponding rise at night. Some non-succulent, small-leaved desert plants and some succulents do not show the same diurnal fall.—*G. F. S. E.*

Trees, Effect of Drought on. By Huebner (*Gartenflora*, vol. lxi. pt. iv. pp. 76-82).—In the district of Teltow the drought of 1911 had a disastrous effect on the Birch, Elm, Juniper, Lime, *Picea excelsa*, *Abies pectinata*, *Taxus baccata*, and *Thuya occidentale*. The Canadian Poplar resisted the drought better than the black and white Poplars. The dry season suited the Tamarisks, *Buddleia*, *Exochorda*, *Hydrangea*, and *Ligustrum*. Green Fly did much damage, but fungoid diseases were less prevalent than usual.—*S. E. W.*

Trees, Ornamental, for Winter. By H. Spath (*Gartenflora*, vol. lxi. pt. vii. pp. 164-167).—The following trees and shrubs should be grown for the colour of their bark in winter: *Acer pennsylvanicum erythrocladum* (the young twigs are scarlet, but the older bark has white markings on a red ground); *Cornus tatarica sibirica* is carmine scarlet, *C. alba* dark red, and *Acer laetum rubrum* brownish purple; *Crataegus saligna* is brownish red; *Prunus Pissardii* dark purple; *Pyrus Niedzwetzkyana* dark red. The new shoots of *Cornus Kesselringi* are nearly black, but the older growth is dark red. The bark of *Salix alba vitellina britzensis* is at first bright red, but changes to dark yellow with age. *Morus alba aurea*, *Corylus Avellana aurea*, and *Alnus incana aurea* have dark yellow barks. *Fraxinus excelsior aurea*, *Cornus alba flaviramea*, *C. sanguinea viridissima*, and *Tilia platyphyllos aurea* have different shades of yellow. *Prunus Laurocerasus schipkaensis*, *Berberis Aquifolium*, *B. nervosa* and *B. repens*, *Pyracantha coccinea*, and Holly are recommended as evergreens. *Euonymus japonica radicans*, *Teucrium Chamaedrys*, *Quercus aizoon*, *Q. Pseudoturneri*, *Q. fulhamensis*, *Q. Lucombeana*, *Rhamnus hybrida*, *Myrica cerifera*, *Crataegus Grignonensis*, *C. flava*, and Privet retain their leaves in winter, and should be grown on this account.—*S. E. W.*

Vanda, Soil for. By A. Heydt (*Orchis*, vol. vi. pt. ii. pp. 27, 28). Well-decayed beech-leaf soil, free from admixture with oak leaves, is the most suitable compost for the cultivation of members of the *Vanda* family.—*S. E. W.*

Vegetation, its Effect on Evaporation. By H. A. Gleason and F. C. Gates (*Bot. Gaz.* pp. 478-491, June 1912; 6 figs.).—The authors arranged twelve standardized atmometers to test evaporation in various associations, all within half a kilometre of each other and near Havana, Illinois. The sandy soil in this district appears to have been gradually colonized by the following succession. First "bunch grass," of which a *Leptoloma* association precedes scattered tufts of an *Eragrostis* association. Then follows *Quercus velutina* woods without shrubs or vines and with little herbaceous growth. The *Q. velutina* wood becomes gradually occupied with vines and herbaceous growth, and then gives place to mixed forest.

The atmometers showed the following results in these various stages: (1) Bare sand (blow out) centre 1.56 of relative evaporation; (2) Ditto sides 1.27; (3) Bunch grass *Leptoloma* 1.18; (4) Ditto *Eragrostis* 1.04; (5) *Quercus velutina*, first stage, .66; (6) *Q. velutina*, second stage, 0.55; (7) Mixed forest margin .36; and (8) Ditto centre .29.

An atmometer in an open field (woods within 150 yards) was taken as standard with evaporation 1. The beach of the lake gave .93, Willows—Acer part .66, and Willows part .44.—*G. F. S. E.*

Veronica, On the Comparative Anatomy of the Leaves of Certain Species of. By R. S. Adamson, M.A., B.Sc., B.A. (*Jour.*

Linn. Soc. vol. xl. No. 276, pp. 247-74, Feb. 1912; with 17 text figs.).—This account deals entirely with species (thirty-nine in number) of shrubby Veronicas which are natives of New Zealand. Previous researches had shown that certain anatomical features are constant through whole genera or even orders of plants. Several characters of this kind have been noticed in the species of *Veronica* examined. Thus in all these shrubby species the lateral walls of the epidermal cells are rectilinear or very slightly curved, not sinuous; the only internal secretion is tannin, and tannin-sacs occur either singly or in groups in the mesophyll of all the species examined; in nearly all the species studied a patch of cork is developed at the point of insertion of the leaf. This arrangement of corky cells at the leaf-base stands in opposition to the view that translocation of carbohydrates is carried on in the cortical region of the petiole. Here, the cortex being completely cut off by these cells, translocation can only go on in the vascular bundle. In *Veronica* this cork layer is found a year or more before the leaf-fall. It is a precocious preparation for the leaf-fall which ultimately takes place by the formation of an absciss layer just above the cork-cells.

These Veronicas occur in the drier climate of the eastern part of South Island, and are almost entirely absent from the moist, warm regions of the western parts of New Zealand. In relation to this distribution these species of *Veronica* all show a more or less pronounced xerophilous structure. The xerophily is arrived at in various ways, the most obvious being reduction of leaf surface, and of the intercellular space system, and the cuticularization of the epidermis. Special adaptions to a dry habitat are described for several species, such as the overarching of the thickened cuticle above the stomatal pores (*V. Hectori*, *V. Traversii*) or the development of water-tissue (*e.g.*, *V. Lewisii*).—*R. B.*

Vines in Australia. By M. Blunno (*Agr. Gaz. N.S.W.* vol. xxii. pt. xii. pp. 1087-1093).—In a hot climate vines produce good crops; the grapes are sweet, yielding wines such as sherry, port, Madeira, or Muscat. In the temperate zone the vines require more manure. The grapes yield lighter wines—viz., Bordeaux, Burgundy, Champagne, hock, or Moselle. In cold climates the grapes are deficient in sugar and contain too much acid.—*S. E. W.*

Vines in Australia. By M. Blunno (*Agr. Gaz. N.S.W.* vol. xxiii. pt. i. pp. 57-64).—Vines planted in fine sandy soil are immune to Phylloxera. The alcoholic strength of the wine depends chiefly on climate; the nearer the equator the richer the grape juice will be in sugar and the wine in alcohol. Light soils are preferred for the production of clarets and fine white wines. In cold districts a heavy ground rich in limestone should be used for this purpose.—*S. E. W.*

Wilting Coefficient for Different Plants and its Indirect Determination. By Lyman J. Briggs and H. L. Shantz (*U.S.A. Dep.*

Agr., Bur. Pl. Ind., Bull. 230).—The object of this investigation was to determine the extent of the variation exhibited by different plants with respect to the minimum point to which they can reduce the moisture-content of the soil before permanent wilting occurs. The conclusion reached was that the differences exhibited by crop plants in their ability to reduce the moisture-content of the soil before wilting occurs are so slight as to be without practical significance in the selection of crops for semi-arid regions. As an example, two such different plants as a *Coleus* and Kubauka wheat wilted simultaneously when grown in the same soil mass.—*D. M. C.*

Wilting of Plants. By Lyman J. Briggs and H. L. Shantz (*Bot. Gaz.* pp. 20-37, Jan. 1912).—After plants have wilted by having too much reduced the water-content of the soil, there is still a loss of water from the soil to the air which goes on through the plant-tissues even after the plant is dead.

This paper on "The Wilting Coefficient and its Indirect Determination" deals with the amount of water usually called non-available that is absorbed by the dying or dead plant and evaporated. The plants (wheat seedlings) were grown in wax-sealed pots. The authors define the wilting coefficient as the percentage water-content of a soil when plants first wilt to such a degree that they cannot recover without the addition of water.

This wilting coefficient was found equal to (1) the moisture equivalent divided by 1.84 (1 ± 0.007); (2) $\frac{\text{hygroscopic coefficient}}{0.68\ (1 \pm 0.018)}$; (3) moisture holding capacity − 21 divided by 2.90 (1 ± 0.021); and (4) 0.01 sand + 0.12 silt + 0.57 clay divided by 1 + 0.025.—*G. F. S. E.*

Woods of the United States, Uses of Commercial. By William L. Hall and H. Maxwell (*U.S.A. Dep. Agr., Forest Service, Bull.* 95, June 30, 1911).—The Cedars, Cypresses, and Sequoias are the three families of trees that are here treated of, and of the Cedar alone no less than eight kinds are considered as sources of lumber and wood supply. A detailed account is given of the trees of *Sequoia* in the famous Calaveros groves, many of which are supposed to be over two thousand years old.—*A. D. W.*

Woolly Aphis, Red-oil Spray for. By W. H. Grant (*Agr. Gaz. N.S.W.* vol. xxii. pt. xii. pp. 107-12).—Red-oil emulsion, owing to its penetrative properties, is more effective than kerosene emulsion for destroying woolly aphis on apple trees. The mixture contains 4 gallons of red oil, 3 lb. hard soap, and 100 gallons of water. It should be warm when used and applied the day it is made.—*S. E. W.*

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PART III.

ORCHID CONFERENCE.

WEDNESDAY, NOVEMBER 6, 1912.

Chairman: MR. J. GURNEY FOWLER.

PROGRAMME.

MORNING SESSION—11 A.M. TO 1 P.M.

Papers.

"The Physiology of Fertilization." Professor F. KEEBLE, M.A., Sc.D., of University College, Reading.

"The Application of Genetics to Orchid Breeding." Major C. C. HURST, F.L.S., Director of the Burbage Experiment Station, Hinckley.

AFTERNOON SESSION—2 P.M. TO 4 P.M.

Papers.

"Some Epiphytic Orchids." Mr. H. G. ALEXANDER, Orchid-grower to Lieut.-Col. Sir George Holford, K.C.V.O.

"Albinism in Orchids." Mr. H. G. THWAITES, F.R.H.S.

MORNING SESSION.

MR. J. GURNEY FOWLER, in opening the proceedings, said: It is now nearly two years since a certain number of growers suggested to the Council of the Royal Horticultural Society that it would be a

good thing, in their opinion, if an autumn show for the exhibition of Orchids could be arranged. The Council fell in with the views expressed, and, so far as I am able to judge, the exhibition is very successful and is worthy of repetition. It will show the flower-loving public that the growing of Orchids is not confined, as has been said in some quarters, to the spring months, but can be usefully indulged in in the autumn too. There are other times in the year when different classes of Orchids are at their best, but it is difficult to exhibit them, owing to various circumstances, and the present exhibition is sufficient to show that many may be used for brightening even the dullest of autumn days. So far as those who live near London are concerned, I fear the reason why Orchids are rarely shown in autumn is that our fogs work such havoc among the flowers; but this reason does not apply in the case of those gentlemen who are fortunate enough to reside in more distant parts of the country.

On an occasion such as this it is not necessary for me to do more than introduce the readers of the papers. After each paper is read I hope many of those present will discuss it, or ask any questions which they may wish further enlightenment upon. The discussions will, I hope, be an interesting and instructive part of the proceedings.

I will now ask Professor Keeble to read his paper.

"THE PHYSIOLOGY OF FERTILIZATION."

Professor F. Keeble: It has been known for many years that in the majority of plants pollination is essential to seed-formation. The fact is so well established and familiar that pollination, which in strictness denotes the transference of pollen from the stamens to the stigma of a flower, is used sometimes as the equivalent of the term fertilization.

Nevertheless, as we shall see, pollination is but one of a series of somewhat complicated processes which result ultimately in seed-formation. Although the dependence of seed-production on pollination has long been known, the nature of the process which intervenes between these events baffled the curiosity and ingenuity of man until comparatively recent times. Of late years our knowledge of these intervening processes has increased very greatly, and, since that knowledge is both interesting in itself and useful in its practical bearings, I propose to sketch in rapid outline the figure of our understanding of the process of fertilization.

The foundations of our knowledge of the nature of fertilization were laid a little over three-quarters of a century ago by Amici, who, in 1830, discovered that pollen grains deposited on the stigma sent out tubes which pass down the style, enter the ovary, and make their way unerringly to the open ends of the ovules (fig. 141). It was not till many years after Amici's time that the real act of fertilization was observed. Some forty years ago it was discovered that the pollen tube, after passing through the opening in the coats of an ovule, becomes thin and soft and discharges part of its contents into the ovule.

At the upper end of the ovule lies a minute but definite mass of living substance or protoplasm, which we may describe as the representative of the seed-parent or as the egg-cell. To this egg-cell a similar living mass derived from the pollen tube makes its way, and so representative cells, one of the seed parent and one of the pollen parent, lie close beside one another. Each consists of a denser central body called the nucleus and a more watery envelope of cytoplasm. The two representative cells fuse with one another—nucleus with nucleus and cytoplasm with cytoplasm—and so form a single cell with a single

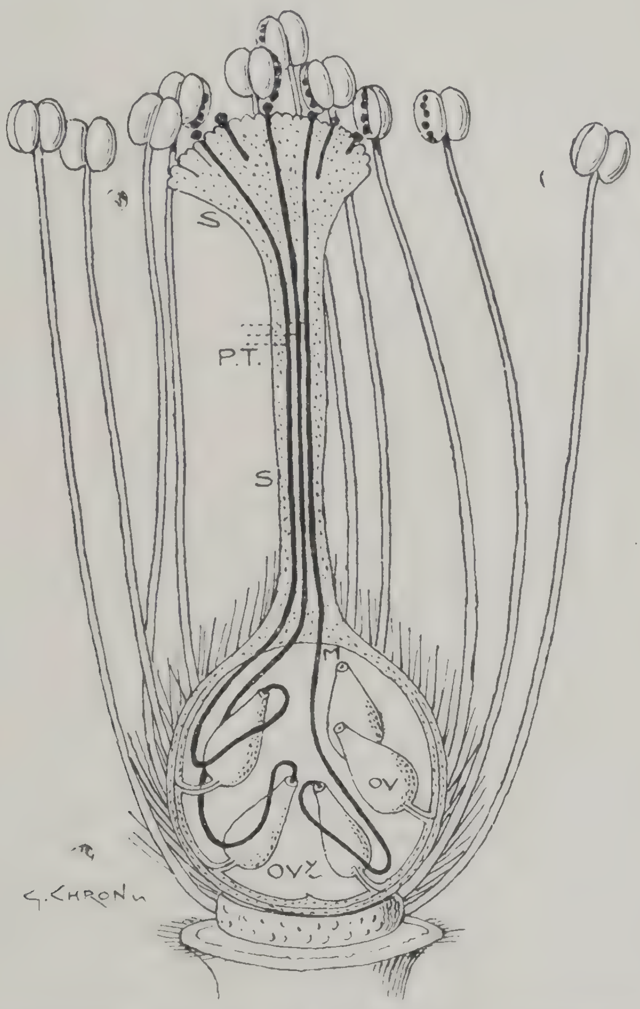


Fig. 141.—Diagrammatic Section of Flower of Helianthemum marifolium, showing Pollen Tubes.

P.T. pollen tubes growing through S, the style, passing into OV^{y}, the ovary, and each reaching M, the micropyle of OV, an ovule. (*After Kerner and Oliver.*)

nucleus. This cell, which, because of its two-fold origin, is called the zygote, undergoes growth and division, and gives rise to the embryo or plantlet of the seed. The adult plant is derived exclusively from the zygote, which, in turn, is formed by the union of the two representative cells.

The essentials of this process of fusion are to be observed not in flowering plants only, but also in all but the most rudimentary of the lower plants. These essentials are to be discovered also in animals.

Hence we may define fertilization as the fusion of two representative sexual cells or gametes, and the production therefrom of a single cell, the zygote, which is an incipient individual.

Since the female gamete, or egg-cell of an ovule, does not, as a rule, form an embryo unless it encounters and fuses with a male gamete, it is evident that this fusion is the essential part of fertilization, and that pollination and the growth of the pollen tubes are but the necessary means to that end. One of the most striking facts which emerge from these discoveries is that both parents make material contributions to the substance of the offspring.

The nuclear contributions appear to be equal in amount and generally similar in kind, but the contributions of cytoplasm made by the two gametes or sexual cells appear to be unequal: the cytoplasm of the egg-cell being considerable; that of the male gamete being smaller in amount and in some cases nil. In the similarity between the nuclei we have the explanation of the well-known fact that, of the many characters exhibited by the offspring, some are derived from one parent, others from the other parent, and others again are intermediate between the paternal and maternal characters. We are not yet, however, in a position to assert that *all* the characters of the offspring are contributed in equal measure by the two parents.

On this subject, however, despite its interest and importance, we cannot dwell now; for we must continue our sketch of the phenomena of fertilization. Inasmuch as the normal egg-cell does not develop unless it has united with the male gamete, it follows that the latter not only contributes living material toward the upbuilding of the future plant, but that the male cell also provokes or stimulates the egg-cell to grow into the embryo. It might be supposed, and indeed it was supposed until recently, that the growth of the fertilized egg-cell is the direct consequence of the yoking together of the male and female gametes. Just as one horse alone might not be able to draw a cart which two horses may pull easily, so it might be imagined that the female or egg cell alone is unable to carry on the work of development, which work is easy to the combined forces of the male and female gametes. Recent experiments have shown that this supposition is not correct, and that the development of the egg-cell to form the embryo is due to a definite shock or stimulus which it receives from the male gamete. In terms of our simile, under the powerful stimulus of the whip the single horse may make a supreme effort and set the cart in motion. We are, therefore, obliged to recognize that fertilization has a two-fold significance. On the one hand it allows of the formation of an individual which derives materially from the father and the mother, and hence may exhibit paternal and maternal characters; on the other hand, the male gamete in entering into the egg-cell exerts a stimulus which starts the latter on a course of growth and division resulting in the formation of the embryo.

The evidence in support of the latter conclusion is clear. Thus it has been shown in certain animals and plants that the fertilization

stimulus may be imparted to the egg-cell artificially and without the aid of the male gamete.

For example, LOEB has demonstrated that, if the egg-cells of sea-urchins be taken from the parent and placed in sea-water free altogether from male cells, an alteration either of the composition or concentration of the sea-water suffices to cause the egg-cells to develop into embryos. Nature herself provides us with illustrations of a similar phenomenon in the case of parthenogenetic plants. Species of *Hieracium*, *Alchemilla*, *Taraxacum*, and other plants are known to give rise to good seed even though the egg-cells be not fertilized. Similar examples of the parthenogenetic development of eggs into embryos are known among various kinds of animals, and particularly in insects—for instance, in the summer broods of aphides.

In parthenogenetic plants and animals the egg-cells carry, as it were, their own stimulus to development; or, rather, the egg-cells of such plants differ from those of the majority of organisms in that they retain the power of development, and are not compelled to await the advent of the male gamete in order to resume their growth. Even more remarkable than the chemical embryos just described are the mechanical embryos which have been produced recently by BATAILLON. This experimenter removed the ripe, unfertilized eggs from the frog, punctured each egg by means of a fine glass needle and covered the eggs with water. Of the punctured eggs many died, but out of 1000 which were operated upon no fewer than 120 hatched into tadpoles and actually reached the stage at which the legs are developed and the tail is disappearing.

Astonishing and well-nigh incredible as are these facts, they are attested so well that they must be accepted. They are, moreover, susceptible of interpretation in terms of the hypothesis at which we have arrived already. The needle-puncture sets up a disturbance in the egg-cell, the effect of which is similar to that exerted by the entrance of the male gamete into the egg-cell. In either case, growth and division occur, and the embryo is produced. Needless to say, a tadpole begotten in this manner constitutes a novel and absolute kind of orphan—namely, one that never had a father. It can possess maternal characters only.

Finally, it may be mentioned that DELAGE and others have succeeded in raising larval animals (Echinoderms) by fertilizing egg-cells deprived of their nucleus by normal male cells. Such larvæ have nuclear material of paternal origin only, and on current hypothesis they should exhibit paternal characters only.

We are now in a position to state with clearness the significance of fertilization. By the fusion of the nucleus of the male and female gametes parental characters are transmitted to the offspring; by the entry of the male cell into the egg-cell the latter is provoked or stimulated to form the embryo. The stimulation is of a chemical or mechanical nature, and may be brought about by artificial means.

That these conclusions apply also to plants there can be no doubt,

and it is by no means improbable that the experimenter of to-morrow may be able to induce plants to develop seed by chemical or mechanical stimulation similar to that which, as we have seen, has proved effective in the lower animals.

It is possible, however, that this experiment has been performed already by Nature herself in the case of *Zygopetalum Mackayi.*

So far as I know, this Orchid does not produce seed unless it be pollinated. When it is pollinated with the pollen of certain other species, *i.e. Odontoglossum crispum*, it produces good seed, but to use the words of my friend Mr. O'Brien, the extent of whose knowledge of Orchids is rivalled only by the generosity with which he imparts it, "the progeny still remain *Zygopetalum Mackayi*, with only sufficient suggestion of a difference in the flowers to prove that the cross has been made. This cross has been made several times with the same result, and other combinations have given rise also to the same progeny." As a contribution to the explanation of this remarkable behaviour I would offer the following suggestions: First, that the offspring of the cross *Zygopetalum Mackayi* by *Odontoglossum crispum* are pure *Zygopetalum Mackayi*; second, that the effect of the pollen of the *Odontoglossum* is that of Bataillon's needle; the pollen or pollen tubes, although they make no material contribution to the egg-cell, give the fertilization-stimulus without which the egg-cells of *Zygopetalum* are unable to develop. Given this stimulus the egg-cells develop parthenogenetically. I am willing to admit, however, that the behaviour of this remarkable plant may be yet more subtle than this, but into a discussion of these subtleties this is not the place to enter. The suggestion just offered—that the only part or lot that *Odontoglossum crispum* has in the fertilization of *Zygopetalum Mackayi* is in providing a fertilization-stimulus—may appear far-fetched to any but those acquainted practically with the ways of Orchids.

Those who work with more torpid, less highly-strung plants may be disposed to ask, What justification is there for the suggestion that the pollen of *Odontoglossum crispum* deposited in the stigmatic surface of *Zygopetalum Mackayi* may, whilst failing to effect fertilization, yet act as a stimulus to the parthenogenetic development of the egg-cells of that plant?

But the man who works among Orchids will not be disposed to be so sceptical. He is aware of the fact that a fly or even specks of dust settling on the stigma may provoke changes in the flower similar to those which follow on pollination. A striking illustration is provided by the specimens of *Odontoglossum crispum*, bearing both normal white and canary-yellow flowers, which are frequently sent to the *Gardeners' Chronicle* by growers who want to know whether the yellow flowers represent a sport. As is known to experienced orchidists the latter colour is assumed by the flower as a consequence of pollination. It may also be induced, as the specimens show, by a contact-stimulus set up by dust or grit falling on the stigma. Having in view such facts as these and also their application to the case of

Zygopetalum Mackayi, it will, I think, be of interest if I bring this paper to a close by describing the progress of attempts to unravel the several processes which are set going in the floral mechanism as a consequence of pollination.

All gardeners know that pollination does indeed set going a long series of changes in the flower and even in the neighbouring parts of the plant.

It is a well-known fact, for example, that many pollinated flowers wither more rapidly than unpollinated flowers.

So marked, indeed, is the difference between pollinated and unpollinated flowers in this respect, that it is worth while in the case of certain self-fertilized flowers to prevent pollination by the removal of the pistil or stamens.

Again, it is a notorious fact that some seedless fruits, certain grapes, currants, &c., do not swell unless they are pollinated. Pollination is useless so far as inducing seed-formation is concerned, but it nevertheless fulfils the secondary purpose, in some seedless fruits, of giving rise to a chemical stimulus under which the fruit walls swell and become fleshy or succulent.

These illustrations, which might, of course, be multiplied, serve to demonstrate that pollination, besides bringing about fertilization, sets up disturbances in the flower, and even in other parts of the plant.

The nature of these disturbances has been investigated recently in orchids and other plants, and as a result of these investigations, although they leave much unexplained, we know definitely that pollination may bring about three types of events. First, fertilization, of which we have treated already. Second, changes due to the contact of pollen with the stigmatic surface. Third, results which may be described as intoxications, or responses to chemical stimulation. Illustrations of marked results arising as the consequence of mere contact of the pollen with the stigmatic surface are exhibited by plants such as *Mimulus*, by orchids, and, doubtless, by many others.

Place a little of its own pollen on the stigma lobes of *Mimulus cardinalis*, and they begin to close. If more pollen be placed on the lobes they close sooner, and remain closed longer. If much pollen be used in the experiment the lobes remain closed; if only a little be placed on the stigma, the lobes separate after a short time.

Careful experiments by Lutz have shown that the closing movement is due to a contact stimulus. As has been known for a long time, the closing movement of the stigma lobes of *Mimulus* and similar plants with sensitive stigmas may be brought about by stroking the surface of the stigma with the finger-nail or with a knife.

The cells of the stigmatic surface are in tension, and charged with water. The irritation, either by a load of pollen or by stroking or scratching, brings about a discharge of water from these cells. Those of the upper surface lose more, and contract more, and, shortening, pull the lower surfaces upwards till the lobes meet.

Any pollen, alive or dead, will serve to bring about this closure, but

unless the pollen used be alive and that of the species itself, the stigma lobes, after a longer or shorter interval, separate once again from one another. That is to say, the shrunk cells re-absorb water, return to their original size, and push the lower surface outward and downward.

But if a good load of pollen of *Mimulus cardinalis* be put on the stigma of a flower of that plant, the stigma lobes close, and open no more. Here we have an illustration of the second of our three results of pollination—namely, that of intoxication. I do not suggest that the failure to re-open means that the stigma of *Mimulus* is plunged in a drunken sleep; but that the failure of the lobes to separate is due to the fact that the pollen excretes a poisonous substance which brings about a disorganization of some of the cells of the stigma, as a result of which they can no longer absorb water, and hence cannot press back the appressed lobes. That this explanation is correct is demonstrated by the fact that a watery extract of the pollen suffices to bring about both a closure and a failure to re-open: the former by setting up a contact stimulus; the latter by poisoning certain of the cells of the stigma, killing them, and thus rendering them incapable of absorbing water.

Toxic actions of this kind would appear to be the key to the explanation of many of the most curious phenomena bearing on pollination. It is well known, for example, that in certain Orchids, *Oncidium flexuosum*, and others, to put the plant's own pollen on the stigmatic surface is to poison it. The flower withers prematurely and fails to set seed (see Darwin's *Annuals and Plants under Domestication*, vol ii., p. 115).

It is just possible, as suggested by Fitting, that sterility may not infrequently be due to a similar cause, and that it might be worth the while of anyone who wished to obtain seed of a sterile form of Orchid, or other plant, to immerse the pollinia, or pollen, in water or a weak sugar solution for three or four hours, in order to remove the toxic substance before using the pollen for breeding purposes. Again, it appears probable that such a toxic action may be reciprocal; that is, that the stigma may, upon occasion, exercise a poisonous influence on, and so prevent the development of, the pollen. Here, again, artifice may perhaps be used to overcome the difficulty. If the stigmatic surface were wiped clean of its sticky fluid, and if, in place of that fluid, other from the stigma of the pollen parent were smeared on the stigmatic surface, it is possible that subsequent pollination might result in fertilization. Only experiment can show whether either of these suggested methods would prove of use, and such experiments are for the botanist rather than the grower to carry out.

No plants show better than the Orchids the diverse effects of pollination, and, inasmuch as these effects have been analysed carefully by Fitting, they must be described, albeit briefly.

The chief changes induced by pollination of Orchids are: premature withering of the flower; swelling of the tissues of the column so as to

enclose the stigmatic surface; swelling and greening of the ovary; and development of the ovules. FITTING worked with species such as *Phalaenopsis violacea* and *P. amabilis*, the unpollinated flowers of which, in their native habitat, persist for a month or more. He showed that withering, as I have indicated already, is the result of contact stimulus. It is induced when not only living, but also dead pollen, or even grains of sand, are placed on the stigmatic surface. Although the withering effect is due also to a contact or wound-stimulus applied to the stigmatic surface, the second consequence of pollination, the arching of the column over the stigmatic surface (fig. 142), is not. This effect is not induced by sand or other fine particles, although it is produced by the plant's own pollen which has been killed by exposure to steam or chloroform. It is the result of a chemical stimulus or intoxication, as is proved by the fact that a watery extract of the plant's pollen, if put on the stigma, induces the swelling (fig. 142, D).

Thus a little cotton wool which has been dipped in such an extract suffices, when placed on the stigma, not only to produce withering by its contact effect, but also to produce the swelling of the column by its chemical effect.

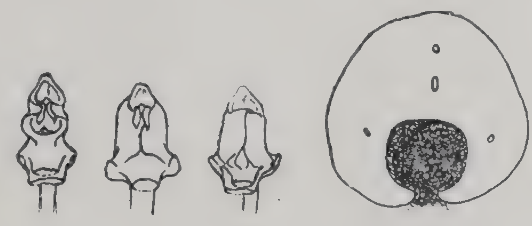


FIG. 142.—PHALAENOPSIS AMABILIS.

(A) column stigma unpollinated; (B) column six days after pollination of stigma; (C) column six days after "pollination" with dead pollen; (D) section of column after "pollination" with cotton wool soaked with pollen extract. (*Fitting.*)

Further, the swelling and greening of the ovary only occur after the pollen tubes have grown some way down towards the ovary, and these changes are to be attributed to yet another chemical effect produced by substances excreted by the developing pollen tubes.

Such, in brief, are the facts which recent research has brought to light with respect to the significance of fertilization, and the origin of the accessory effects of pollination. They show in graphic way what a highly organized mechanism is the flower. They indicate that it is attuned to respond in definite manner to different kinds of stimulation, and they prove that many responses on the part of the plant are called forth by definite chemical substances. Although our knowledge is yet too imperfect for it to be of evident service to the Orchid raiser, it is not without promise that it may throw light on the strange phenomena of sterility, and perhaps provide us with means of overcoming that refractoriness. Thus we may anticipate the making of yet more wonderful mongrels than those which now delight the amateur, confound the botanist, and confuse the student of nomenclature.

Discussion.

Mr. J. O'Brien: Professor Keeble in his admirable paper did me the honour of mentioning me in connexion with certain of the particulars which he cited during his able explanation of the phenomena of fertilization. What he said recalled to my mind a number of experiments which I made some forty years ago, and in which the late Charles Darwin took some interest. The experiments were not in regard to the effect of any natural agent on seed-production, but rather related to what might be called the effect of mechanical agencies upon the flower suggesting fertilization. They were made with the object of testing the effect of false pollination by using foreign substances or by transitory irritation of the stigmatic surface instead of placing pollen upon it. In these experiments fully-grown fruits resulted, perfect in every way except in containing fertile seeds. Even the imitation of the action of insects in attempting to visit the flower for pollination purposes was not without marked effect. For instance, when the petals of *Miltonia Russelliana*, which clip together over the column, were forced apart by an insect in search for food, or even by a pencil, the lip withered, although the stigmatic surface had not been interfered with in the slightest degree. In fact, in this instance, and also in cases where full-grown fruits were obtained without the use of pollen, there was evidence that the tissues concerned in reproduction acted as though proper fertilization had taken place, and each function was duly carried out on this assumption, though fertile seeds were not produced.

That false pollination without actual fertilization is not a very unusual thing in nature seemed to be indicated by some remarks made to me by the late Consul F. C. Lehmann, to whom I mentioned the comparative rarity of seed-capsules on imported plants of *Odontoglossum crispum*, and especially the finest forms. Consul Lehmann said that he had noticed the same thing on the plants growing in their native habitat, but that occasionally he had seen small patches growing in exposed situations, often swept by hurricanes bearing grit and other substances on the wind, heavily laden with fruits—a circumstance for which he was at a loss to account, as the plants were badly situated for fertilization by insect aid. On telling him of my experiments, he agreed that the capsules were the result of false fertilization, as it might be called. With regard to the species of *Phalaenopsis*, they might be divided into two groups: the thin-petalled section (*Phalaenopsis Aphrodite*, &c.), in which the flower-segments withered quickly, and the section with fleshy segments (*Phalaenopsis Luddemanniana*, &c.), where the flower lost its colour but still remained firm, changing to bright green, and being at a distance indistinguishable from the leaves. In both cases the essential result—loss of attraction—was the same.

With regard to the change in colour in the floral segments of *Odontoglossum crispum* mentioned by Professor Keeble, I found that

either with natural or false pollination they changed from white to pale yellow in the original type, but in some of the best modern forms the flowers assume a lilac shade. This seems to indicate that, although now one so-called species, different characters have arisen during the development of these newer forms.

Mr. GURNEY WILSON: Would Professor KEEBLE tell us whether it is possible for more than one pollen grain to fertilize the same ovule?

Professor KEEBLE replied that so far as was known only one pollen grain would have any effect on fertilization, although probably many would grow down the substance of the style and possibly enter the ovary.

Mr. H. G. THWAITES inquired what effect pollen grains from two different species or hybrids placed upon the same stigma would produce?

Professor KEEBLE said that either one or the other would probably effect fertilization, for one would probably grow down the style more rapidly than the other and reach the ovule first.

Mr. R. A. ROLFE wished that some one would conduct a series of experiments with *Zygopetalum Mackayi* in the same way that Sir HARRY VEITCH did with *Cattleya Mossiae.* It would then be possible to see whether the pollen tubes reached the ovules. He thought not, for the seedlings were always pure Zygopetalums, and he believed they were simply developed from parthogenetic buds as a result of the stimulus of pollination.

Mr. W. H. HATCHER: We have made an interesting cross at Rawdon recently. The pollen of *Odontoglossum crispum* was placed upon another flower of *Odontoglossum crispum*, and at the same time pollen of *Miltonia vexillaria* was placed on the same stigma. The result is curious, for every seedling shows very strong traces in its habit of growth of the *Miltonia.* Although the seedlings have not yet flowered, it is clear the *Odontoglossum* pollen has had but little effect upon the offspring, if any.

In reply to questions Mr. HATCHER made it clear that the two kinds of pollen were placed upon the stigma within a few minutes of one another.

Mr. J. M. BLACK asked whether any reason could be given for some species of Orchids rejecting the pollen after it had been placed upon the stigma.

Mr. G. WILSON thought it was probably a matter of accommodation, for if the pollinium were too large it would be pushed off the stigma by the closing over of the staminodes or side wings of the column, which usually occurs after pollination.

After some remarks by Mr. DE BARRI CRAWSHAY, the CHAIRMAN called upon Major HURST for his paper on

"THE APPLICATION OF GENETICS TO ORCHID BREEDING."

Major C. C. HURST: The new science of Genetics has been built up during the past decade on the firm foundations laid by MENDEL

nearly fifty years ago. The Royal Horticultural Society, through its far-seeing Secretary, the Rev. W. WILKS, took a leading part in the introduction of MENDEL's work to English readers some twelve years ago, and in the meantime the Society has in many ways helped to advance the new science of Genetics.

It is therefore fitting that the Orchid Conference held to-day under the auspices of the Society should have the opportunity of discussing the question of the application of Genetics to Orchid breeding.

The word "Genetics" was first used by Professor BATESON at the time of the International Hybridization Conference held by the Royal Horticultural Society in London in 1906, and was used by him as a convenient word to express the modern science of breeding on Mendelian lines. Technically the word "Genetics" covers not only the primary principles of heredity as understood and expounded by MENDEL himself, but also the secondary developments of Mendelism that have taken place during the past decade in consequence of the experiments and observations of Mendelians in all parts of the world not only with cultivated plants, but also with domesticated animals, including Man himself.

Perhaps the most remarkable feature in the progress of the modern science of Genetics is the extraordinary way in which experiments with plants have led to the solution of important problems in animal breeding; while, on the other hand, experiments with animals have in their turn led to the solution of many difficulties in plant breeding. As experiment follows experiment, and discovery succeeds discovery, the word "Genetics" will still cover the ground, and its influence and utility will become increasingly marked as time rolls on.

Orchids are truly regarded as the aristocrats of the plant world, and the results achieved by Orchid breeders during the past twenty years constitute one of the seven wonders of the world of horticulture. No other family of cultivated plants has yielded so many beautiful hybrids in so short a time as the Orchidaceae. A reference to the "Orchid Stud Book" shows that at least 40 genera and 300 distinct species have been already utilized by Orchid breeders in the making of their hybrids. About 2000 of these are primary hybrids, while no fewer than 300 are generic hybrids. Besides these botanical hybrids, there are on record some thousands of horticultural —secondary and multiple—hybrids, to say nothing of multitudinous varietal and individual forms which no man can number.

When one remembers that most of these remarkable results have been achieved in less than a generation (one might almost say, since the last Orchid Conference was held), and that the raising of such delicate exotics from seed under purely artificial conditions is by no means an easy matter even for the expert, one cannot but admire the practical genius of British and Continental Orchid breeders that has brought about such a consummation. Those who had the good fortune to see the remarkable display of Orchids at the International Exhibition at Chelsea last May must have been impressed

by the leading part played by hand-raised hybrids in the various groups.

In face of such an imposing array of beautiful hybrids it may seem presumptuous on the part of a student of Genetics to offer to the Orchid breeder any suggestions as to the advantages that might be derived from an application of the science of Genetics to Orchid breeding, for where practical Orchid breeding has been so successful the application of the science of Genetics might naturally be regarded as somewhat superfluous. But those behind the scenes know better. The wonderful hybrids that appear in public represent only one side of the picture.

Orchid breeders of experience know too well that in order to secure a really first-class hybrid it is necessary to raise large numbers of others. Many are raised, but few are chosen. Some crosses naturally yield more good forms than others, but generally speaking first-class hybrids are few and far between, and the moderate and poor forms are far too numerous. In secondary and more complex hybrids especially, the number of misfits and unwanted weeds that turn up time after time is rather disconcerting, and the question often arises as to whether many of these crosses are worth making at all from the economic point of view, though from the scientific standpoint they are naturally most instructive.

Old and New Methods.

From this it is evident that chance plays a great part in modern Orchid breeding, and there is really very little certainty in the game as played by the leading exponents. Now, if the modern science of Genetics teaches anything, it is that there are *certainties* to be found in breeding. A careful study of recent work in Genetics points unmistakably to the important fact that law and order may be perceived in breeding. From the economic point of view it costs just as much to raise a poor form as it does a good one, the time, trouble, and expense involved are the same, and the practical problem that faces the Orchid breeder is how to manage his matings so as to reduce the number of worthless forms to a minimum.

This is where the application of Genetics to Orchid breeding should come in to help the breeder. Of course, in the early stages of the application it cannot be expected that all Orchid breeding will be reduced to a certainty, that would be too much to expect; nor would it be altogether desirable, for in such a case Orchid breeding would be divested of much of its charm. Already a few certainties in Orchid breeding are known, thanks mainly to the application of the Mendelian principles, and that many other certainties await discovery there can be no doubt.

One important point, however, should be noted, and that is that under present conditions Orchid breeders must very largely discover these certainties for themselves by the application of the principles of Genetics. In this respect Orchid breeding differs much from

ordinary plant breeding. The Orchid field is so wide, the conditions so difficult, and the complications so numerous, that only a practical expert can carry out the necessary experiments, and even he must have considerable resources of capital and experience at his command.

In order to apply Genetics to Orchid breeding it will be necessary for the Orchid breeder to make himself familiar with the first principles. These principles are now universally accepted by all serious students of heredity who have experimented for themselves, and they can be applied equally to all kinds of plants and animals, including Man himself. From the practical point of view it will not be necessary for the Orchid breeder, at the outset at all events, to venture much beyond these first principles. His own experiments, if based on these principles and carefully carried out, will soon yield a harvest of valuable data that will lead him on to more advanced work and to a deeper insight into the possibilities and certainties of Orchid breeding.

First Principles of Genetics.

Each plant or animal is composed of many characters, most of which are heritable.

Each heritable character is represented in the germ-cells by one or more factors.

In the fertilized cell (*zygote*) each factor is present either in a double state or a single state.

When a double dose of the factor is present, the plant or animal is called *homozygous*, or pure in regard to that factor.

When a single dose of the factor is present, the plant or animal is called *heterozygous*, or impure in regard to that factor.

When the factor is altogether absent, the plant or animal may be called *zerozygous*, or wanting in regard to that factor.

Previous to fertilization the germ-cells divide, and *segregation* takes place in regard to each factor.

Each cell with a *double* dose of the factor becomes two fertilizing-cells (*gametes*), each with a *single* dose of the factor.

Each cell with a *single* dose of the factor becomes two fertilizing-cells (*gametes*), one of which has a *single* dose of the factor and the other has *none*.

Fertilization consists in the union of two fertilizing-cells (*gametes*), a pollen or sperm cell from the male uniting with an egg-cell from the female.

If both paternal and maternal gametes have a *single* dose of the factor, a zygote will be formed with a *double* dose of the factor, and the plant or animal will be *homozygous*, or pure in regard to that factor.

If, however, one of the gametes has a *single* dose of the factor and the other has *none*, a zygote will be formed with a *single* dose of the factor, and the plant or animal will be *heterozygous*, or impure in regard to that factor.

If *neither* of the gametes has the factor at all, it will of course be

altogether absent from the zygote, and the plant will be *zerozygous*, or wanting in regard to that factor.

Practical Consequences.

The practical consequences of these first principles of Genetics are that, as regards any one heritable character represented by a factor, there are three distinct kinds of individual plants: (1) homozygous, or pure; (2) heterozygous, or impure; and (3) zerozygous, or wanting. Each of these three kinds of individuals will give a different result when bred from. With regard to outward appearance, (3) will as a rule be easily distinguishable from (1) and (2), representing as it usually does the hypostatic or recessive form, from which the epistatic or dominant character is quite absent.

If, as sometimes happens, a single dose of the dominant factor produces the same effect in the zygote as a double dose, we get the phenomenon of complete dominance, and in such cases (1) and (2) are indistinguishable in outward appearance, and their pure or impure nature can only be determined by breeding from them.

If, however, as often happens in Orchids, a single dose of the dominant factor produces a different effect in the zygote from a double dose, we get the phenomenon of incomplete dominance. In such cases (1) and (2) are distinguishable in outward appearance, and their pure or impure nature is determined at sight without breeding from them.

The apparent blending of characters observed in many Orchid hybrids is no doubt due to the effect of the single dose of one factor reacting on the effect of a single dose of another factor, resulting in a mosaic.

When more than one heritable character is involved in the breeding problem, as usually happens in Orchids, the different kinds of individual plants become exceedingly numerous. One plant, for instance, may be pure for one character, impure for another, and wanting for a third character, and so on. Each individual plant, however, has a definite germinal constitution, which can be ascertained by cross-breeding it with other plants. In this way a factorial analysis of the two plants can be made, and, as regards each heritable character, each plant will be found to be either pure (homozygous), impure (heterozygous), or wanting (zerozygous), and as such it will behave when bred from. Once the factorial analysis of a plant has been made, all future breeding from that plant is reduced practically to a certainty.

Colour and Albinism.

Recent results show that in certain cases an apparently simple heritable character is due to the presence of more than one distinct factor. For instance, in Orchids we have already one case of that description, and no doubt there are many more yet undiscovered. From evidence collected by the writer during the past five years,*

* Bateson, W., *Mendel's Principles of Heredity* (1909), pp. 96–97; Hurst, C. C., "Inheritance of Albinism in Orchids," *Gard. Chron.* (1909), i. p. 81; Hurst, C. C., "Mendel's Law of Heredity and its Application to Horticulture," *Journ. Roy. Hort. Soc.* vol. xxxvi. (1910), pp. 44–48, figs. 20–34.

there can be little doubt that the rosy-purple colour present in the flowers and leaves of the various species of *Cattleya* and *Cypripedium* is due to the simultaneous presence of two complementary colour factors, which we call C and R. If one or both of these factors is absent, the result is a true albino, with no trace of purple sap in the flowers and leaves. This purple colour can only be produced when the two factors C and R are both present.

Now, as we have just seen, the colour factors C and R may be present in a double state—CC and RR—or in a single state—Cc and Rr—or they may be absent altogether—cc and rr; consequently no fewer than five different kinds of albinos may exist, as follows:—

(1) CCrr
(2) Ccrr
(3) ccRR
(4) ccRr
(5) ccrr

For the sake of convenience it is usual in Genetics to represent the presence of a factor by a capital letter and its absence by a small one.

These five albinos may be absolutely identical in appearance and outward characters, yet each has a different germinal constitution, and consequently will give different results in breeding. Each of these five albinos will breed true to albinism when selfed, but when they are crossed *inter se*, different results will be obtained. Thus, out of the fifteen possible matings, eleven will give all albinos, two will give on the average equal numbers of albinos and coloured forms, one will give one coloured form to three albinos, and one will give all coloured forms.

Table I. gives the factorial details of these fifteen matings, showing how the above calculations have been made.

TABLE I.—(Albino Matings).

Parents	Offspring	Result
(1) CCrr × (1) CCrr	All CCrr	All Albinos
(1) CCrr × (2) Ccrr	1 CCrr : 1 Ccrr	All Albinos
(1) CCrr × (3) ccRR	All CcRr	All Coloured
(1) CCrr × (4) ccRr	1 CcRr : 1 Ccrr	1 Coloured : 1 Albino
(1) CCrr × (5) ccrr	All Ccrr	All Albinos
(2) Ccrr × (2) Ccrr	1 CCrr : 2 Ccrr : 1 ccrr	All Albinos
(2) Ccrr × (3) ccRR	1 CcRr : 1 ccRr	1 Coloured : 1 Albino
(2) Ccrr × (4) ccRr	1 CcRr : 1 ccRr : 1 Ccrr : 1 ccrr	1 Coloured : 3 Albinos
(2) Ccrr × (5) ccrr	1 Ccrr : 1 ccrr	All Albinos
(3) ccRR × (3) ccRR	All ccRR	All Albinos
(3) ccRR × (4) ccRr	1 ccRR : 1 ccRr	All Albinos
(3) ccRR × (5) ccrr	All ccRr	All Albinos
(4) ccRr × (4) ccRr	1 ccRR : 2 ccRr : 1 ccrr	All Albinos
(4) ccRr × (5) ccrr	1 ccRr : 1 ccrr	All Albinos
(5) ccrr × (5) ccrr	All ccrr	All Albinos

C represents first colour factor.

R represents second colour factor.

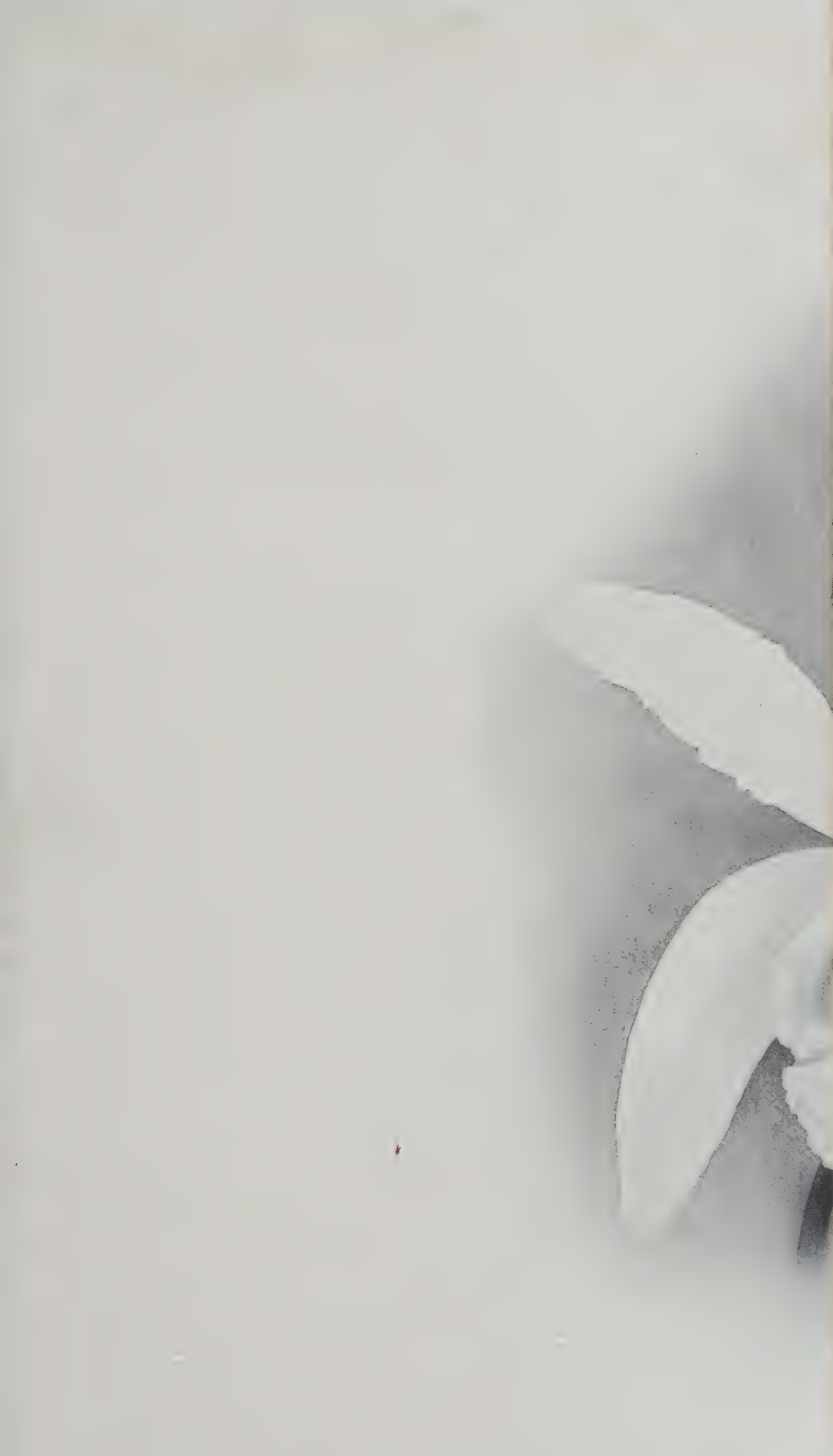
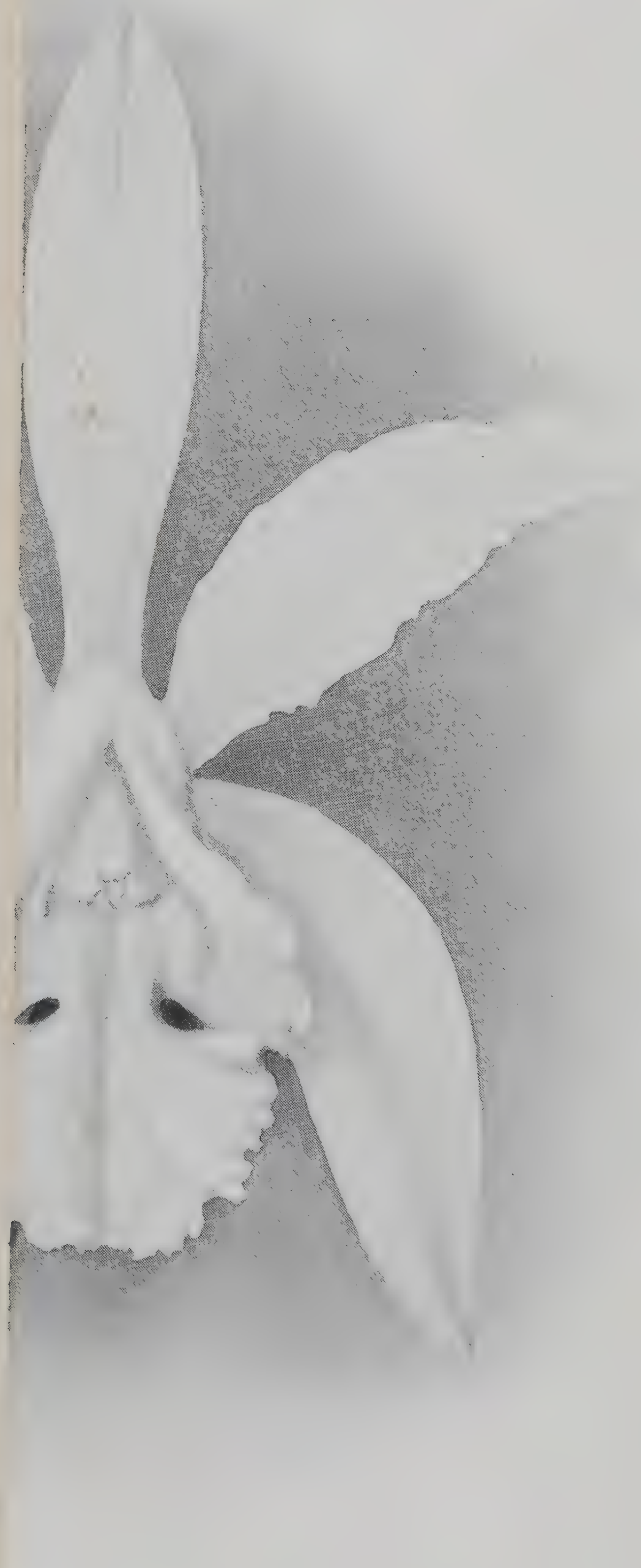


Fig. 144.—Ca



TTLEYA INTERMEDIA ALBA.

CC and RR represent double presence of factors C and R—*i.e.*, homozygous, or pure.

Cc and Rr represent single presence of factors C and R—*i.e.*, heterozygous, or impure.

cc and rr represent absence of factors C and R—*i.e.*, zerozygous, or wanting.

The same scheme of course applies equally to coloured forms as to albinos. Thus four distinct kinds of coloured forms are possible, *viz.*:—

(*a*) CCRR
(*b*) CCRr
(*c*) CcRR
(*d*) CcRr

These four coloured forms may be absolutely identical in appearance and outward characters, yet each has a different germinal constitution, and consequently will give different results in breeding. Of the ten possible matings, five will give *all* coloured forms, four will give on the average three coloured forms to one albino, and one will give on the average nine coloured forms to seven albinos.

Table II. gives the factorial details of these matings, showing how the above calculations have been made.

TABLE II.—(Coloured Matings).

Parents	Offspring	Result
(*a*) CCRR × (*a*) CCRR	All CCRR	All Coloured
(*a*) CCRR × (*b*) CCRr	1 CCRR : 1 CCRr	All Coloured
(*a*) CCRR × (*c*) CcRR	1 CCRR : 1 CcRR	All Coloured
(*a*) CCRR × (*d*) CcRr	1 CCRR : 1 CCRr : 1 CcRR : 1 CcRr	All Coloured
(*b*) CCRr × (*b*) CCRr	1 CCRR : 2 CCRr : 1 CCrr	3 Coloured : 1 Albino
(*b*) CCRr × (*c*) CcRR	1 CCRR : 1 CCRr : 1 CcRR : 1 CcRr	All Coloured
(*b*) CCRr × (*d*) CcRr	1 CCRR : 1 CcRR : 2 CCRr : 2 CcRr : 1 CCrr : 1 Ccrr	6 Coloured : 2 Albinos
(*c*) CcRR × (*c*) CcRR	1 CCRR : 2 CcRR : 1 ccRR	3 Coloured : 1 Albino
(*c*) CcRR × (*d*) CcRr	1 CCRR : 1 CCRr : 2 CcRR : 2 CcRr : 1 ccRR : 1 ccRr	6 Coloured : 2 Albinos
(*d*) CcRr × (*d*) CcRr	1 CCRR : 2 CcRR : 1 ccRR : 2 CCRr : 4 CcRr : 2 ccRr : 1 CCrr : 2 Ccrr : 1 ccrr	9 Coloured : 7 Albinos

Further interesting results will be obtained by mating the four coloured forms with the five albino forms.

Of the twenty possible matings, seven will give *all* coloured forms, eight will give on the average equal numbers of coloured and albino forms, two will give three coloured forms to five albinos, two will give three coloured forms to one albino, and one will give one coloured form to three albinos.

Table III. gives the factorial details of these matings, showing how the above calculations have been made.

Table III.—(Coloured × Albinos).

Parents	Offspring	Result
(*a*) CCRR × (1) CCrr	All CCRr	All Coloured
(*a*) CCRR × (2) Ccrr	1 CCRr : 1 CcRr	All Coloured
(*a*) CCRR × (3) ccRR	All CcRR	All Coloured
(*a*) CCRR × (4) ccRr	1 CcRR : 1 CcRr	All Coloured
(*a*) CCRR × (5) ccrr	All CcRr	All Coloured
(*b*) CCRr × (1) CCrr	1 CCRr : 1 CCrr	1 Coloured : 1 Albino
(*b*) CCRr × (2) Ccrr	1 CCRr : 1 CCrr : 1 CcRr : 1 Ccrr	2 Coloured : 2 Albinos
(*b*) CCRr × (3) ccRR	1 CcRR : 1 CcRr	All Coloured
(*b*) CCRr × (4) ccRr	1 CcRR : 2 CcRr : 1 Ccrr	3 Coloured : 1 Albino
(*b*) CCRr × (5) ccrr	1 CcRr : 1 Ccrr	1 Coloured : 1 Albino
(*c*) CcRR × (1) CCrr	1 CCRr : 1 CcRr	All Coloured
(*c*) CcRR × (2) Ccrr	1 CCRr : 2 CcRr : 1 ccRr	3 Coloured : 1 Albino
(*c*) CcRR × (3) ccRR	1 CcRR : 1 ccRR	1 Coloured : 1 Albino
(*c*) CcRR × (4) ccRr	1 CcRR : 1 CcRr : 1 ccRR : 1 ccRr	2 Coloured : 2 Albinos
(*c*) CcRR × (5) ccrr	1 CcRr : 1 ccRr	1 Coloured : 1 Albino
(*d*) CcRr × (1) CCrr	1 CCRr : 1 CCrr : 1 CcRr : 1 Ccrr	2 Coloured : 2 Albinos
(*d*) CcRr × (2) Ccrr	1 CCRr : 1 CCrr : 2 CcRr : 2 Ccrr : 1 ccRr : 1 ccrr	3 Coloured : 5 Albinos
(*d*) CcRr × (3) ccRR	1 CcRR : 1 CcRr : 1 ccRR : 1 ccRr	2 Coloured : 2 Albinos
(*d*) CcRr × (4) ccRr	1 CcRR : 1 ccRR : 2 CcRr : 2 ccRr : 1 Ccrr : 1 ccrr	3 Coloured : 5 Albinos
(*d*) CcRr × (5) ccrr	1 CcRr : 1 Ccrr : 1 ccRr : 1 ccrr	1 Coloured : 3 Albinos

Identification of Individual Stud Plants.

The practical consequences of these first principles are important and far-reaching from the Orchid breeder's point of view.

If each individual plant grown from a seed has a definite germinal constitution which determines its breeding powers and potentialities, then it is necessary that each individual plant used as a parent should have an identification mark. Whether this identification mark consists of an individual name, a stud number, or anything else is simply a matter of convenience, so long as the identity of each stud individual is maintained for future use. In 1909 the writer * suggested that identification might be assured by putting the name of the importer or raiser in brackets after the ordinary name together with a number showing the order of its appearance—*e.g.*, *Cypripedium callosum Sanderae* [Sander I.], [Low I.], [Cookson I.], [Statter I.], and so forth. The first was imported in 1894, the second in 1904, and the third and fourth were raised by hand presumably from the first. All divisions of the original plant, as a rule, may be expected to have the same germinal constitution, and would consequently bear the same identification mark.

There is no doubt that in course of time certain individual plants would acquire a stud reputation much in the same way as a noted sire or brood mare does in thorough-bred horses, and the propagation of such an individual Orchid by division and its distribution would become a valuable economic asset.

* Hurst, C. C., "Inheritance of Albinism in Orchids," *l.c.*

Having secured the identification of each individual stud plant, the next step is to ascertain its germinal constitution by breeding from it. The original Mendelian method was to self the plant, but recent results show that this method alone is not sufficient to give a complete analysis of the germinal constitution of a plant. In order to do this it is necessary to cross-breed with it as a parent, and in cases like albinism, for instance, this is the only method possible. From this it is evident that the ordinary experiments in hybridization and cross-breeding made by Orchid breeders are precisely what we require in order to ascertain the germinal constitution of individual plants, provided that each individual plant used as a parent is carefully identified for future reference and use.

Self-Sterility in Orchids.

The question of selfing Orchids leads us to another point which may be of some interest. Records of the flowering of seedlings from selfed hybrids are exceedingly rare in Orchids. At one time the writer thought that this might be due, on the one hand, to the practical prejudice against in-breeding, or, on the other hand, to the idea that nothing new might be expected from selfing. Now, however, after attempting to self several hundreds of different flowers of *Cypripedium* and other Orchid hybrids at Burbage during the past ten years, the writer has come to the conclusion that self-sterility in hybrid Orchids has to be seriously reckoned with, being apparently the rule rather than the exception For instance, since publishing my Mendelian experiments with *Cypripedium* × 'Hera' in 1903,* I have from time to time endeavoured to self the individual F_2 hybrids as they flowered, but in every case but one when the pods formed they afterwards proved to be empty. A few seeds, however, were secured from one pod of selfed *C.* × 'Hera' *punctatum*, and a single F_3 plant has flowered which bred true to its spotted parent in so far as the spotted character was concerned.

On the other hand, Mr. R. A. Rolfe† has obtained a number of seedlings at Kew of selfed *Epidendrum* × *kewense*, several of which have flowered, and other odd records are to be found during the past twenty years, where selfed Orchid hybrids have produced plants which have flowered. These cases, however, appear to be exceptional.

In 1898 the writer ‡ showed that sterility in hybrid Cypripediums was due in certain cases to a loss of power in the pollen of hybrids. For instance, species ♀ × species ♂ produced 95 per cent. of fertile pods, while species ♀ × hybrids ♂ gave only 56 per cent. Again, hybrids ♀ × species ♂ produced 89 per cent., while hybrids ♀ × hybrids ♂ gave only 59 per cent. It is possible that the same cause may be concerned in the self-sterility of Orchid hybrids generally, plus some other factor unknown.

* Hurst, C. C., "Mendel's Principles Applied to Orchid Hybrids," *Journ. Roy. Hort. Soc.* vol. xxvii. (1903), pp. 614–24, figs. 167–69.

† Rolfe, R. A., "Epidendrum × kewense: A Mendelian Experiment," *Orch. Rev.* vol. xv. (1907), pp. 58, 59. [See also xvii. (1909), p. 69.]

‡ Hurst, C. C., "Notes on some Curiosities of Orchid Breeding," *Journ. Roy. Hort. Soc.* vol. xxi. (1898), pp. 485, 486.

Whatever difficulties may be met with in selfing hybrid Orchids, no such difficulty is apparently encountered in selfing certain species and varieties. I have found no special difficulty in raising seedlings of selfed species and varieties of *Cypripedium*, and many records are to be found in this and in other genera in Orchid literature.* In view, however, of the great successes achieved by Orchid breeders in the hybridization of diverse species and genera, it is hardly likely that selfing will be resorted to now to any great extent either in species or hybrids.

As we have seen, cross-breeding is a far more effective method of analysis than selfing, even from the point of view of Genetics. The crux of the whole problem, however, lies in the identification of individual plants. Unless this is done all the rest is vain. Unfortunately, with a few brilliant exceptions, our multitudinous Orchid records and labels are almost useless for this purpose. Some of these brilliant exceptions consist of certain unique hybrids to which their owners gave a distinctive name, proudly refusing to conform to the technical rules laid down by the authorities in nomenclature (and by the irony of fate the writer happened to be one of the latter). Many of these names can be traced in the "Orchid Stud Book" as synonyms, and it is possible that the natural conservatism of Orchid breeders has caused them to retain many of these old names on their labels. If such is the case, the identification of some of our best stud individuals may not be so difficult after all.

In most cases, however, the adoption of genetic methods will necessitate the making over again of the best hybrids, using as parents the best *individuals* of the best varieties of the best species of the best genera. The primary hybrids thus obtained would be pedigree hybrids, and the best individuals of these might be further utilized in accordance with the particular aims that the breeder may have in view. In this way the Orchid breeder would be able to build up a pedigree strain made up of superior individuals, and the reversions and recombinations that he would obtain among the secondary hybrids would also tend to be superior to those bred in the ordinary way.

In breeding on these lines the Orchid breeder will soon discover for himself that while a few stud individuals may be homozygous, or pure for the good qualities required, the majority will be heterozygous, or impure for those particular characters. For stud purposes these impure forms should be discarded at once, no matter how good-looking they may be, and only the pure forms should be used for future breeding. Should the pure forms not turn up quickly enough for his purpose, the breeder can always make them from the impure forms in the ordinary Mendelian way. In many cases, no doubt, this will be well worth doing.

This rigorous elimination of the impure plants that throw unwanted forms may sometimes require considerable courage on the part of the Orchid breeder, involving as it does the sacrifice of certain prejudices

* Cf. the case of self-sterility in *Oncidium flexuosum*; Hurst, C. C., "Curiosities of Orchid Breeding," *l.c.* p. 460.

and predilections, especially when it comes to the point of discarding for stud purposes a much-prized plant that has perhaps won the classic **F.C.C.** at the R.H.S. The science of Genetics tells us plainly that things are not always what they seem, and a good-looking plant is not always a good plant to breed from. Only a few Derby winners are successful at the stud, everything depends on their germinal constitution. From the genetic point of view it would be a far sounder proposition to use for breeding an individual Orchid that had *bred* an **F.C.C.** winner than to use an actual winner of the **F.C.C.** that had a bad breeding record.

The **F.C.C.** awarded by the Orchid Committee of the R.H.S. is universally acknowledged to be the highest prize in the Orchid world, and winners of this prize may be regarded as classic Orchids. From the point of view of Genetics, the individual parents of these classic winners deserve special recognition as stud Orchids.

A reference to the records shows that during the past five years some 200 **F.C.C.s** have been awarded by the Orchid Committee of the R.H.S. Of these **F.C.C.** winners about 150 appear to be hand-raised hybrids. Of the parents of these hybrids only 50 can be identified from the records as individual plants, and it is quite possible that a few of these names even may be represented in collections by more than one seedling individual.

Table IV. gives a list of these classic stud Orchids, showing how many of their progeny have won the **F.C.C.** at the R.H.S. since November 1907. This short list is presented simply as an illustration for Orchid breeders of the potential value of certain stud Orchids, and there is no doubt that the list might be considerably extended with much advantage to the breeder.

Table IV.—(Classic Stud Orchids).

	Numbers of Progeny won **F.C.C.** at R.H.S. Nov. 1907–Nov. 1912.	
Odontoglossum Rossii rubescens	5	
Cattleya Mossiae Wageneri	3	(fig. 143.)
Cypripedium insigne Sanderae	3	
Cattleya intermedia alba	2	(fig. 144.)
C. labiata alba	2	(fig. 145.)
C. Trianae 'Imperator'	2	(fig. 146.)
C. Warscewiczii 'Frau Mélanie Beyrodt'	2	(fig. 147.)
Cypripedium × 'Hera Euryades'	2	
C. insigne, Harefield Hall var.	2	
C. × 'M. de Curte'	2	
Laelia tenebrosa, Walton Grange var.	2	(fig. 148.)
Odontoglossum maculatum auriferum	2	
Calanthe × *Sedeni burfordiensis*	1	
C. × 'Baron Schröder'	1	
Cattleya × *Fabia alba*	1	
C. × *Fabia Vigeriana*	1	
C. Gaskelliana alba	1	
C. × *Hardyana alba*	1	
C. Mossiae aurantiaca	1	
C. Mossiae Reineckiana	1	
C. Trianae, Uplands var.	1	
Cypripedium aureum 'Œdippe'	1	
C. Harrisianum superbum	1	
C. × 'Hera Mariæ'	1	

TABLE IV.—(Classic Stud Orchids)—*continued.*

	Numbers of Progeny won F.C.C. at R.H.S. Nov. 1907–Nov. 1912.
C. × 'Hera' *robustum*	1
C. × 'J. Howes'	1
C. × *Leeanum giganteum*	1
C. × *Leeanum* 'Prospero'	1
C. × 'Milo,' Westonbirt var.	1
C. × 'Minos,' Young var.	1
C. 'Niobe,' Westonbirt var.	1
C. × *nitens magnificum*	1
C. × *nitens*, Sander's var.	1
C. Sallieri Hyeanum	1
C. × *Thompsonii*	1
C. × 'Troilus'	1
Dendrobium nobile nobilius	1
Laelia anceps Schroederiana	1
Laeliocattleya × 'Hippolyta Phœbe'	1
Miltonia Bleueana Peetersii	1
M. vexillaria 'Queen Alexandra'	1
Odontoglossum × *Adrianae* 'F. K. Sander'	1
O. × *amabile heatonense*	1
O. × *amabile* 'Royal George'	1
O. crispum 'Britannia'	1
O. crispum 'F. K. Sander'	1
O. crispum Graireanum	1
O. Pescatorei Charlesworthii	1
O. × *Vuylstekeae*	1
O. × *Wilckeanum albens*	1

May I venture to suggest that special groups made up of these stud Orchids and their progeny would provide an exhibit at the R.H.S. Shows that would not only be interesting to Orchid growers generally, but would be particularly useful to Orchid breeders as a demonstration of the germinal constitution of these stud Orchids? Competitive classes might even be arranged for these progeny tests to decide which individual Orchids are best for stud purposes.

The result would be to create a special demand for high-priced stud Orchids that hardly exists to-day. In view of the increasing number of Orchid-growers all over the world, it is hardly likely that such a demand would be confined to the British Isles, and there is no reason why this country should not in the future provide the world with stud Orchids, as it does to-day with thoroughbred horses and pedigree animals generally.

So far we have dealt with the general application of the principles of Genetics to Orchid breeding. It may be useful now to put the matter into a somewhat more concrete form by suggesting briefly a few special possibilities of the practical application of Genetics to Orchid breeding.

THE BREEDING OF ALBINOS.

The beauty and value of albino Orchids is generally recognized, and the Orchid breeder naturally wishes to raise new and improved forms by hydridization. In other words, he wishes to vary the shape and size of the flower while retaining the chaste beauty of the albino. So far as we know, all albino Orchids breed true to albinism when selfed, but no remarkable improvement in shape, size, and distinctness can be obtained in this way. On the other hand, as we have already

seen, when different species of albinos are crossed, they do not always breed true to albinism, but often give coloured forms, which are not wanted by the Orchid breeder.

The science of Genetics has provided a reasonable explanation of these interesting results. Experiments are yet wanting to provide breeders with a complete analysis of the germinal constitution of all the well-known albinos, and this cannot be satisfactorily accomplished until we can be quite certain as to the identification of individual albino plants, and, more important still, *that the albinos concerned are true albinos.*

Subject to the above reservations, the following list of twenty-six well-known albinos is given, with their presumed germinal constitutions so far as ascertained:—

Cypripedium callosum Sanderae	ccRR
C. Lawrenceanum Hyeanum	ccRR
C. × *Maudiae*	ccRR
C. insigne Sanderianum	ccRR
C. × *Rossetti*	ccRR
C. bellatulum album	CCrr
Cattleya Mossiae Wageneri	ccRR
C. Gaskelliana alba	ccRR
C. × *Hyeae*	ccRR
C. × *Hyeae* 'Suzanne'	ccRR
C. × *Hyeae* 'Jungfrau'	ccRR
C. intermedia alba	ccRR
C. labiata alba	ccRR
C. × *Mackayi Dusseldorfei*	ccRR
C. × *Mackayi* 'Undine'	ccRR
C. × *Mackayi*, Westonbirt var.	ccRR
C. × Brenda	ccRR
C. × *Peetersiae* 'Myra'	ccRr
C. Harrisoniana alba	CCrr
C. Mendelii alba	CCrr
C. Schroederae	CCrr
C. Warneri alba	Ccrr
Dendrobium nobile virginale	ccRR
D. Wardianum album	CCrr
Odontoglossum crispum xanthotes	ccRR
O. Pescatorei album	ccRR

These albinos may be divided into two classes—C albinos and R albinos. To secure all albino offspring C albinos must be mated with C albinos, and R albinos with R albinos. If C albinos are mated with R albinos, coloured forms are bound to arise. The above list may serve a useful purpose as a provisional one for breeders to work upon, and no doubt further results in the near future will enable us to extend the analysis considerably, and also to confirm, or otherwise, the above tentative germinal constitutions.

In working with albinos Orchid breeders must be careful to distinguish between true albinos and false albinos. True albinos have pure white flowers and green leaves, *without a trace of purple sap-colour*, though yellow and green plastids are usually present in the flowers. As we have seen, one or both of the colour factors C and R are absent from the germ-cells of these forms. On the other hand, false albinos, like *Cypripedium insigne Sanderae*, *C. Lawrenceanum Gratrixianum*, *Cattleya Mossiae Reineckiana*, and others, have a certain

amount of purple sap-colour in the flowers and leaves, and consequently are not true albinos, though for practical purposes they are usually called "albinos," and in many cases are quite as beautiful and as much sought after as the true albinos. In these false albinos both the colour factors C and R are present, and consequently they give quite different results in breeding from the true albinos. These false albinos are really dilute coloured forms, and the fact that they usually behave as Mendelian recessives in breeding shows that their condition is due to the absence of a factor for dense or full coloration, which factor is present in the typical coloured form.

The different kinds of dilution found in most species suggest that more than one factor is concerned in the typical dense form. This application of Genetics to Orchid breeding explains a good many apparent mysteries. For instance, it explains why the false albino *Cypripedium insigne Sanderae* breeds true to its special dilute form or throws true albinos when selfed, and yet behaves as if it were an ordinary *C. insigne* when crossed with the true albinos *C.* × *Maudiae*, *C. Lawrenceanum Hyeanum*, and *C. callosum Sanderae*. These true albinos arose originally by the loss of a colour factor (C), but the factor for dense coloration (D) would still be present in those albinos, though not manifested on account of the albinism. When this factor for dense coloration (D) is brought in by the cross, it naturally causes the parent *C. insigne Sanderae* to behave as if it were an ordinary *C. insigne*.

If these so-called "reversionary" forms were to be self-fertilized or crossed *inter se*, both the recessive dilute coloration (dd) and the albinism (cc) would appear in certain individuals. On the average, the dilute forms would be expected to appear in three out of sixteen plants, and the albino forms in four out of sixteen plants. The recent cases reported in which the true albino *Cypripedium Lawrenceanum Hyeanum*, crossed with the false albino *C. niveum*, gave typical coloured plants of *C.* × 'Aphrodite,' and in which the false albino *C. niveum*, crossed with the false albino *C. Lawrenceanum Gratrixianum*, gave the false albino *C.* × 'Antigone' *album*, are of course easily explained in the same way. To the student of Genetics such cases as these present no difficulty, as numbers of similar cases are well known in other plants and in animals.

The Re-making of a Blotched Crispum.

In 1909 the writer * showed that the "blotched" character in Odontoglossums behaves as a Mendelian dominant to the "plain" character, which is recessive. Since then further evidence has given ample confirmation. The logical consequences of this application of Genetics to Orchid breeding lead one to support Mr. de Barri Crawshay's idea, expressed many years ago, that blotched crispums first appeared in a wild state through natural hybridization with other species.

From the point of view of Genetics, a dominant character is due

* "Mendel's Law and its Application to Horticulture." *Gard. Chron.* 1909, i. p. 303.

FIG. 145. CATTLEYA LABIATA ALBA.

[To face p. 124.

Fig. 146.—Cattleya Trianae 'Imperator

to the addition of a factor, while a recessive character is due to the subtraction of a factor. A blotched *crispum* therefore consists in the addition of a factor to the ordinary typical plain *crispum*. The question arises, How was this dominant blotched character added to the typical plain *crispum*? In order to illustrate the point we will take in hand the re-making of a blotched *crispum* by crossing an ordinary white plain *crispum* with one of the yellow blotched species that grows with *O. crispum* in Colombia—say, *O. luteopurpureum*; the result will be, of course, the F_1 yellow blotched hybrid known as *O.* × *Wilckeanum*, yellow being dominant to white, and blotched to plain. This natural hybrid appeared in importations before it was first raised in gardens.

Next we will re-cross this yellow blotched hybrid with another white plain *crispum*. The expected result, as far as these two characters are concerned, will be that in F_2, out of four plants, we shall get on the average one yellow blotched, one yellow plain, one white blotched, and one white plain. Among the white blotched forms will be found blotched crispums. There can be little doubt that is how the blotched crispums originated in a wild state by natural hybridization.

Other crossings might, of course, give the blotched *crispum*, but it seems more likely that it should originate from this particular cross than any other on account of the natural distribution of these forms, as estimated by their frequency in importations. Further confirmation may be found in the fact that so far all the imported blotched crispums that have been bred from have proved to be heterozygous, or impure to the blotched character, giving plain forms when mated together.

For instance, the blotched *O. crispum* 'Franz Masereel,' *O. crispum* 'Leonard Perfect,' *O. crispum Lindeni*, *O. crispum Victoria-Regina*, *O. crispum* 'Rossendale,' *O. crispum Mariae*, *O. crispum* 'Luciana,' *O. crispum Crawshayanum*, and *O. crispum* 'Alphonso' all give a few plain forms when mated with other blotched forms, showing that each has only a single dose of the blotching factor. This indicates that one of their parents was a plain *crispum*, otherwise some homozygous blotched forms would surely have turned up amongst them.

The next step for Orchid breeders to take, therefore, is to breed these heterozygous, or impure, blotched forms *inter se*. On the average, one out of three of the blotched forms produced in this way should be homozygous, or pure, with a double dose of the blotching factor. These when bred from will give *all* blotched forms, whether mated with other blotched forms or with plain forms. The interesting blotched forms recently raised by Messrs. W. Bull from *O. crispum* 'Franz Masereel' × *O. crispum* 'Alphonso' would provide excellent material for such an experiment.

It will, of course, be understood that the blotched character in Odontoglossums is a very variable one, the blotches vary in size, form, and number, while the pattern varies with the species used. It would be an interesting study to work out the several factors that are no doubt concerned in the different kinds of blotching. The plain form of *O. crispum* is, of course, usually slightly spotted, especially on the lip.

The yellow ground colour in Odontoglossums varies considerably in shade according to the species and variety used. Some of the bright yellow species are evidently heterozygous, or impure, carrying cream recessive, as may be seen in some of the F_1 results of yellow × white in certain primary hybrids where segregation into the two distinct shades, cream and canary-yellow, is evident. When a pure white ground appears in F_1 results of yellow × white, it is evidently due to the impure nature of the wild yellow form used as a parent.

The Making of a Scarlet Crispum.

A large number of interesting problems have already been taken in hand by Orchid breeders, some of which bid fair soon to be successful, though to the student of Genetics the results seem to be slow in coming to hand.

The question, for instance, of the making of a scarlet *crispum* by combining the scarlet self-colour of *Cochlioda Noezliana* with the large size of *Odontoglossum crispum*. The making of a scarlet Cattleya by combining the scarlet self-colour of *Sophronitis grandiflora* with the large size and broad segments of the species of the *labiata* group of *Cattleya*. The making of a yellow *Cattleya* by combining the yellow self-colour of *Laelia Cowanii* with the large size and broad segments of the *Cattleya*. These and other problems equally interesting to Orchid breeders are, judging by the results recently presented, now well on the way to a solution.

There is no doubt that the application of the principles of the Genetics to these problems would not only help to hasten their solution, but would also save much wastage of mistaken matings. In the three particular problems noted above the first crosses in F_1 all show a more or less incomplete dominance, both of the desired colour and size characters. In other words, the *single* dose of each factor present in the primary hybrid gives a different result from the *double* dose of each factor present in the pure parents. Thus the *double* dose of the factor present in the *Cochlioda*, *Sophronitis*, and *Laelia* parents produces the scarlet or yellow colour to perfection, whereas the *single* dose of the factor present in the primary hybrids reproduces the scarlet or yellow colour more or less imperfectly.

The same thing happens in regard to the factor for size. The *double* dose of the factor present in the *Odontoglossum* and the *Cattleya* parents produces the large size desired, whereas the *single* dose of the factor present in the primary hybrids does not. The simple solution of the problem, therefore, lies in choosing the particular matings that will give a *double* dose of each of the two characters that the Orchid breeder wishes to combine, in these cases the scarlet or yellow colour and the large size. It is obvious that this can be done by mating two of the F_1 hybrids together, and if the case is a simple one, as it appears to be, the desired result should be secured in F_2, on the average in one plant out of every sixteen raised.

From this it will be seen that the common practice of mating the

primary hybrid back to one of its parents cannot be expected to succeed, because such a mating implies the presence of a *single* dose only of one of the two characters concerned. By such a mating one of the characters is secured by a *double* dose at the expense of the other, which can only have a *single* dose. Further, the many attempts that have been made to secure the result by breeding from secondary and more complex hybrids only lead to unnecessary complications, because owing to segregation it is quite possible to lose the desired factor altogether in the second generation F_2, and the securing of a double dose of it by means of such matings is a matter of considerable uncertainty, with the chances very much against the breeder.

In passing, it may perhaps be useful to point out that the common practice of analysing Orchid hybrids of complex parentage in terms of fractions of their parents and ancestors is to be deprecated. In Orchid literature we often see it stated, for instance, that a certain hybrid is made up of $\frac{1}{8}$A, $\frac{1}{8}$B, $\frac{1}{4}$C, and $\frac{1}{2}$D. In the modern light of Genetics such statements are not only misleading, but in most cases they must of necessity be erroneous. The simple fact of the segregation of characters in the second generation altogether upsets such a calculation. It is the *pedigree* that may be said to be so constituted, not the individual hybrid.

So far, we have dealt with the three particular problems by applying the principles of Genetics in a general way to enable the breeder to secure a definite result in the shortest possible time. Space will not allow one to deal with the interesting mass of minor details concerned in these three problems. One or two special points however may be noted. Judging from the F_1 results recently produced it would appear that in order to get a true scarlet *crispum*, *Cochlioda Noezliana* should be crossed with an *Odontoglossum* with a white ground colour—*e.g.*, *O. crispum* or *O. Pescatorei*; and in order to avoid, if possible, the presence of purple sap in the segments it would seem advisable to use the albino *O. crispum xanthotes* or *O. Pescatorei album* in preference to the tinged, blotched, or plain forms, using, if possible, Charlesworth's individual R forms of these albinos, which breed true when crossed.

In order to get a crimson *crispum* it would appear that *Cochlioda Noezliana* should be crossed with an *Odontoglossum* with a yellow ground—*e.g.*, *O. triumphans* or *O. luteopurpureum*; and to avoid the dull purple tint in the crimson, the xanthic albinos *O. triumphans* 'Ajax' and *O. luteopurpureum Vuylstekeanum* might perhaps be used to advantage. The presence of some purple sap in the *column* of *Cochlioda Noezliana* may or may not complicate matters. It all depends whether the column colour is inherited independently of the rest of the flower or not; if a form can be secured in which the usual purple colour in the column is absent, this possible complication might be avoided.

In the making of a scarlet Cattleya the elimination of the rose-purple sap of the Cattleya is equally important in order to get the true

colour, and it would therefore seem advisable to use with the *Sophronitis* the albino form—*e.g.*, *Cattleya Mossiae Wageneri* and *C. Gaskelliana alba.* If the (C) albinos of *C. Warneri* and *C. Schroederae* are used, care must be taken not to put them in the same experiment in which the (R) albinos of *C. Mossiae* and *C. Gaskelliana* are used, otherwise the sap-colour will appear.

In place of *Sophronitis grandiflora*, the species *Laelia harpophylla* or *L. cinnabarina* might be used, but the result would be a lighter and more orange shade of scarlet.

In the making of a self-yellow Cattleya, the species *Laelia Cowanii* or *L. flava* would appear to be the best to use. *C. Dowiana aurea* and *L. xanthina*, being bi-colors, would be unsuitable for breeding selfs. It is rather curious that, while the yellow colour of *C. Dowiana aurea* is completely recessive to the rose-purple colour of the Cattleyas, the yellow colours of *L. Cowanii*, *L. flava*, and *L. xanthina* are dominant, though in most cases the dominance is incomplete. The F_1 results suggest that the colour of the front lobe of the lip may be inherited independently of the rest of the flower. The bi-colors *C. Dowiana* and *L. xanthina* give purple or crimson lips when mated with albinos, while *L. Cowanii* and *L. flava* apparently do not; but *L. flava* when mated with the coloured forms of certain species gives a crimson or purple lip, while with other species it gives a self-yellow flower. *L. Cowanii* so far appears to give all yellow selfs with both coloured and albino forms.

In the making of a self-yellow *Cattleya*, all these details will have to be carefully considered by the breeder in choosing his matings. It may be interesting to anticipate that a rather curious point will arise in the making of these scarlet and yellow Cattleyas. Technically, according to the present rules, the scarlet Cattleyas bred in the way suggested would belong to the genus × *Sophrocattleya*, while the yellow Cattleyas would be classed as × *Laeliocattleya*. But, as the writer pointed out in 1904,* the generic characters which separate *Cattleya* from *Laelia*—*i.e.* four pollen-masses and eight pollen-masses respectively—themselves behave as Mendelian characters, and segregate in F_2 in the same way that specific and varietal characters do. Consequently some of the scarlet and yellow Cattleyas raised in these experiments will have four pollen-masses only, and in that sense would be indistinguishable from the systematist's true *Cattleya*. Being homozygous, they would also breed true to that character. In view of this, it hardly seems logical to call them × *Laeliocattleya*; and if the Orchid breeder, for other reasons of his own, chooses to call these forms Cattleyas, in the circumstances it will be a rather difficult matter to deny him.

Economics and Eugenics.

The application of the principles of Genetics to Orchid breeding brings out an economic point of considerable importance, the apprecia-

* Hurst, C. C., "Mendel's Discoveries in Heredity," *Trans. Leic. Lit. and Phil Soc.* vol. viii. (1904), p. 129. (See also *Orch. Rev.* vol. xi. (1903), p. 233.)

tion of which should save the breeder a considerable amount of time, trouble, and expense. From what we have shown, it is evident that no useful purpose can be served by the indiscriminate matings of complex hybrids, which are far too common in Orchid breeding. From the economic point of view, it is extremely doubtful whether it is really necessary to go beyond the mating of primary hybrids in Orchid breeding. We have seen that any two good qualities can be combined in this way in the second generation, in a single experiment, with two, three, or four species of genera.

If more than this be required, other parallel experiments can be carried out at the same time, and the respective results of the separate experiments can, if really necessary, be combined afterwards. For instance, Experiment 1 might be carried out to make a dark scarlet *Cattleya* from *Sophronitis grandiflora*, while Experiment 2 might be carried out at the same time to make a light scarlet Cattleya from *Laelia harpophylla*. When these two shades of the scarlet Cattleya are obtained in the second generation, they might be mated together in order to produce in the third generation a scarlet *Cattleya* superior to both.

Another great advantage in the adoption of the method of parallel experiments would be that the special secondary hybrids obtained in this way will of necessity have a double dose of each of the two good qualities bred for; consequently they will be equally valuable for use as stud Orchids, being homozygous, or pure to the desired characters, they will breed true to themselves when selfed, and will give more definite and less variable results when crossed with one another.

The application of the principles of Genetics to Orchid breeding leads one to conclude that, from the economic and eugenic points of view, the only sound method to adopt in Orchid breeding is to make a fresh start by selecting a choice stud of the best *individuals* of the best varieties of the best species of the best genera, due preference being given to those stud individuals that have already *bred* winners of the **F.C.C.** at the R.H.S., and have also proved themselves to be *homozygous* in their good qualities. These selected stud Orchids should be combined by crossing in every possible way, in order to make superior primary stud hybrids. Finally, these superior stud hybrids can be combined in any way that the breeder may think fit, in accordance with the particular objects he may have in view.

Discussion.

Mr. de Barri Crawshay asked how it was possible to ascertain whether a particular plant was homozygous, heterozygous, or zerozygous for any particular character. Would it be necessary to breed from the plant in several successive years to obtain the information? Referring to the need for keeping accurate records of all the offspring of any particular mating in order to obtain an accurate basis for future work, Mr. Crawshay said he feared the extraordinary mortality among Orchid seedlings would greatly interfere with the results obtained when

dealing with these plants. He hoped they would have an opportunity for the future discussion of Major HURST's paper, which contained so much and such important matter that it could not all be assimilated without prolonged study after it was in print.

Major HURST said that in order to ascertain the gametic constitution of any Orchid, once breeding from it would be sufficient. The results obtained would show whether the plant was pure or impure for any particular character, and whether that character was altogether absent.

Mr. W. H. HATCHER inquired whether the results recorded by Major HURST in regard to albino Orchids were based upon theory, or whether they were obtained after practical experiments. If the latter, would Major HURST kindly say whether records had been kept and were available for reference?

Major HURST said the results with albino Orchids to which he had referred had been published in the records of the Royal Horticultural Society's exhibitions or in the *Gardeners' Chronicle*, &c. He had also had an opportunity of examining several collections where these results had been obtained.

Mr. J. O'BRIEN thought that Major HURST had shown how special Orchids might acquire a greatly enhanced value for breeding purposes, and commended the idea to the careful consideration of all Orchid breeders.

The CHAIRMAN, in bringing the session to a conclusion, said that all present would desire to thank both Professor KEEBLE and Major HURST for the admirable and lucid expositions they had given of their subjects. He feared that life was not long enough to do all the things that Major HURST had suggested, but much might be accomplished if people would keep complete and accurate records of all the plants that were raised. We should then be in a position to judge more accurately of the number of plants bred compared with the number that obtained first-class certificates, and should have a better idea of the value of individual plants for breeding purposes.

AFTERNOON SESSION.

After the luncheon interval the CHAIRMAN called upon Mr. H. G. ALEXANDER, Orchid grower to Sir George Holford, C.I.E., K.C.V.O., for his paper on

"SOME EPIPHYTIC ORCHIDS."

Mr. H. G. ALEXANDER: Having been honoured by a request from the Council to read to-day a paper on the cultivation of Orchids, I propose giving my observations on the treatment most essential to the successful cultivation of the epiphytic section, for the greater number of the really showy, useful, and popular kinds are members of this extensive division of the family.

Speaking of Orchids generally, there is at the present day not only a very remarkable development of hybrids of artificial origin—a progression entirely brought about by the energetic work of our

hybridizers—but also a very visible and great improvement everywhere noticeable in their cultivation. Nevertheless, there are still a few epiphytes responsible for much of the disappointment occasionally experienced in Orchid growing.

In support of the latter statement I need only instance the genera *Cattleya*, *Laelia*, and *Dendrobium*, also *Phalaenopsis*, *Aerides*, *Vanda*, and other distichous kinds. Some of these epiphytes, notably the species and hybrids of Cattleyas and Laelias, the bigeneric Laeliocattleyas, Sophrocattleyas, and Sophrolaelias, the deciduous and evergreen Dendrobium, and *Phalaenopsis* and *Vanda coerulea* are, probably, the most beautiful and desirable of all Orchids. The majority of these are unequalled in the gorgeous character of their beautiful flowers, and whether used in a cut state for floral decoration, or as flowering plants staged for exhibition, a distinct and rare effect is always produced, hence their constant advance in popular estimation.

Having enumerated some of the genera in which difficulties of cultivation are likely to be found I may be expected to make a few remarks concerning the best method of growing these plants up to the high standard now demanded in present-day collections and at all our important shows.

In the cultivation of all plants there are many different roads to success, and particularly so with Orchids. A special treatment cannot be judiciously recommended for the plants generally, for one cannot be certain that the conditions and surroundings are in all cases precisely similar. This fact renders the giving of definite advice extremely difficult. However, I hope from my suggestions some practical hints may be derived for guidance in determining under what conditions these epiphytes best succeed permanently. I emphasize "permanently," for, unquestionably, cultivators are often deluded by successes which are not permanent. In support of this statement, one may point to the luxuriant growth which Orchids of all kinds make, when grown in soft, spongy material—leaf soil, for example. They do well for a few years, but subsequently lapse gradually into an enfeebled and unhealthy state.

The system of cultivation, most nearly approaching that of Nature, must, undoubtedly, be the best. In the growing or flowering of Orchids success or failure depends on several matters: heat, light, air and moisture being the main factors; to these the cultivator must give continual attention, using his mind as well as his hands. A uniform system of treatment is not always advisable. Growing plants according to a schedule, and without taking into consideration the peculiar characteristics of the house in which they are growing, in my opinion, frequently leads to an unsatisfactory result.

Nowadays much lighter houses are built for orchid growing than was formerly the rule. Still, there are thousands of orchids which have to be grown in houses that are darker than they should be. A conviction often forced upon me is that many of the evils affecting Orchids under cultivation are directly traceable to *want of sufficient light*,

either through the plants being too heavily shaded, or the house being improperly constructed. Very often, on account of the structure being unfavourably situated, the light is intercepted by trees or other objects in the immediate vicinity.

In instances where epiphytic Orchids such as I have mentioned occupy houses in which light is insufficient, the growth is deceptive; deficiency of light, especially when accompanied with much artificial heat, usually causes increased development of the leaves and pseudo-bulbs. This very exuberant growth is sure to exhaust itself, and, in course of time, the plants gradually become debilitated.

When Orchids have to be grown in houses affording less light than the plants require, plenty of air, will, to some extent, make up the deficiency, but, as a natural consequence, an extra amount of air means slower growth. Any attempt, in an insufficient light, to hurry a plant is certain to end in failure. *Light is a most essential element*, and is so potent in its influence, that not only will plants grown under it produce flowers more freely, but the enduring properties of the blooms are greatly increased, frequently to the extent of lasting twice as long as others grown under darker conditions. Moreover, the plants are hardier, that is, they are not so susceptible to slight errors of treatment in other ways. For instance, Phalaenopses, Vandas, or any of the distichous-leaved Orchids, which are quite easy to cultivate under a dense shade during the summer months, have a fresh, green appearance which may be pleasing to the eye, but the growth made under such conditions is too susceptible to atmospheric variation. Should the temperature of the house drop a few degrees below the normal, or if the plants are removed for exhibition purposes, many of the leaves so ill-built will, in all probability, become spotted.

I will not suggest that any of the previously mentioned Orchids will bear full exposure to light, but the cultivator's aim should be to control it in keeping with the plant's requirements. Shading should be employed to *break* or *diffuse* the light rather than actually obstruct the sunshine itself. This is not a difficult matter, with movable blinds, easily rolled up or down, on light rollers, and made of suitable material. Fixed shading of any description is not good in practice, for it shuts out the light so much needed by the plants during the morning and evening and many of the sunless days which we have in summer.

Concerning this matter of light for Orchids, the more I see of their cultivation so much the more confident do I feel of the injury that can be done to them by overshading. I have always observed that all Orchids which flower while the plants are in full growth do so in a much more satisfactory manner when under the influence of a good light, and especially is this noticeable with the Cattleya family.

Whenever I meet with plants in a more *robust condition* than usual, I nearly always find that more light has reached them than many growers will consider needful. Instances of this kind are often noticed where such plants are usually in the hands of those who,

FIG. 147. CATTLEYA WARSCEWICZII VAR. 'FRAU MÉLANIE BEYRODT.'

[To [illegible]

although good general plantsmen, profess to know little or nothing about Orchids. Hence has arisen that off-hand assertion "all Orchids are easy of cultivation."

Another great requisite in the cultivation of epiphytic Orchids is a full and free ventilation, not only during the day time, but also by night, whenever it can be managed without creating a draught. With Orchids in their natural conditions of growth, air is ever present in quantity, for these plants not only grow on high rocks and branches of trees, but in many instances on trees which are isolated and exposed to a constant current of air. *Vanda coerulea* may be mentioned as an example of the latter conditions.

Therefore, under cultivation, these Orchids, whose natural position is in the open, must have plenty of air; in fact, it is absolutely necessary, for, if there be any shortage in the supply of this very important element the plants cannot possibly acquire solidity in their various parts, a condition so essential to healthy existence. Judicious use, therefore, of the ventilators of the house is always important at all seasons of the year. Growth made out of season is often attributable to insufficient air on past occasions.

To give an abundance of air when the sun shines, and to admit it only by a chink on dull days and by night, are, to my mind, equally absurd. This close-shutting system, especially at night with a view to keeping up a desired temperature, produces on these Orchids an amount of mischief difficult to calculate. I never could see the reason why ventilation, if so beneficial during the day time, should not be equally so during the night. Fresh air all night, with reasonable temperature, *must* be more conducive to health and vigour than anything approaching a stuffy atmosphere. This cooler and more airy treatment at night is, I believe, more practised in present-day cultivation than hitherto, but I am still of the opinion that it is not yet sufficiently appreciated. Whenever the outside temperature is not below 40° F., and the low level ventilators are left open at night, the fresh, moist air is constantly streaming in, and not nearly the amount of damping down is needed to keep the air soft and genial.

Respecting the maintenance of suitable night and day temperatures, there is little doubt that these, speaking generally, are often kept too high. All Orchids require more or less heat, but many would be far better under cooler atmospheric conditions than are at present allowed. So sensitive are these plants to atmospheric influence that, no matter how well they are treated in other ways, they cannot long continue in a satisfactory condition unless a proper atmosphere is maintained about them. Perhaps it would not be correct to say that "that which is pleasant to the senses is right for these plants," but, at the same time, one can usually tell, on entering a house, whether the air has that soft, light and pleasant feeling so essential to their well-being.

I never advise sticking close to a stated temperature, especially when the outside climatic conditions are unfavourable, having always found much better results accrue from working in accordance with

the weather, and by keeping the houses comfortably warm, with the air in active circulation, and not too heavily charged with moisture. In the growing of these Orchids the state of the atmosphere is ten times more important than any kind of compost for the plants to root into can possibly be.

Epiphytic Orchids are remarkable for the great variety of their flowers and foliage, as well as for the life and partiality to certain substances of their roots. Everyone with a little experience is well aware how closely these plants are dependent upon their roots. In their absence, either through decay or other reason, it is useless to look for healthy growth or superior flowers.

This brings me to another important point. I am convinced that the reason why these epiphytic Orchids sometimes fail in the hands of certain cultivators is because of their practice of affording too much moisture to the roots. Presuming these plants are growing in pots or baskets in the ordinary way, and the usual present-day rooting material is employed, there still remains to be answered the oft-repeated question: How often should certain Orchids be watered? An answer to this question is impossible.

Some terrestrial Orchids require a compost almost saturated with water, a condition totally unsuitable for epiphytes. The ability of the latter class of plant to take up little or much moisture is mainly determined by the amount of air they receive, and by the light and description of the houses in which they are grown. Light and air naturally enable any plant to take up more moisture by means of its roots, but these organs of nutrition must be in a suitable medium. Any great excess of moisture causes young roots in course of formation to die prematurely, and often results in the death of the older ones.

The kinds of Orchids which I have mentioned require comparatively little water at their roots, the only exception being in the height of their growing season, for, if furnished with plenty of live roots, they seldom shrivel, even when the compost shows scarcely a vestige of moisture. The roots already in existence continue to grow in the dry material, unmistakable evidence of conditions favourable to the health of the plant.

In nine cases out of ten the season's growth of epiphytic Orchids precedes root action by a longer or shorter period. In this matter of watering we should be guided by Nature, and only supply water in moderate quantities to the roots, until it is seen that increased supplies are called for by their activity and the demands made on them by the developing growths. I very much doubt if there are any plants under cultivation that require more discrimination in the matter of watering.

When the roots of these Orchids require water, no matter at what stage of activity, or season of the year, only enough should be given to maintain the plants in health, always avoiding that excess which causes the roots to decay. Rain-water is preferable for all plants as being the most natural and purest. Particularly is this the case with

epiphytes, for in their natural state they can never experience the effect of any other kind.

The question of whether any form of manure can, with advantage, be used for epiphytic Orchids is one of long standing. Let me say at once that, personally, I am opposed to its use, and it has never been my custom to utilize it, considering it, as I do, a risky proceeding when dealing with rare and valuable plants. On the rare occasions, when I have experimented with stimulants, the effect on the plants has always been disastrous. So far as feeding is in any way concerned, I feel convinced that these Orchids, being plants of comparatively slow, as well as small, growth, can only take, naturally, a limited amount of sustenance, and any attempt at increasing this by aid of manures is all but certain to prove harmful in the end.

Another matter in connexion with the cultivation of these Orchids, and one in which some growers are liable to make mistakes, is the treatment during the resting period. This term *rest* is, I fear, often misunderstood. It does not imply a periodical shrivelling of the plant by withholding water and lowering the temperature, but more of what I may term a *compromise* between temperature and atmospheric condition.

The resting period of these Orchids takes place more or less during the winter, a time of year when the temperature is lower and evaporation is not so rapid, and it is then that the plants require less atmospheric moisture and water at the roots. It is principally on this point that a considerable amount of knowledge and experience is required so as to adapt the varying conditions to meet the needs of the different plants. For example, the distichous-leaved section require more frequent watering during their inactive period than any pseudobulbous kinds. Vandas, Phalaenopses, and similar kinds, require just sufficent moisture in the rooting material to keep the foliage plump and firm.

Plants of this section, which are overdried during winter, will often lose many of their leaves when the sap begins to circulate freely in the spring. On the other hand, too much moisture when the roots are inactive leads to damping, spot, and other attendant evils. The impression existing in the minds of some growers that a severe drying of Cattleyas, Laelias, Dendrobiums, and other pseudobulbous kinds is necessary to induce them to flower is a great mistake.

Those Orchids that require keeping dry at the root during their season of rest, benefit to an extent dependent on the conditions under which they have been grown. If the leaves and pseudobulbs are solid and stout in texture, especially those which are evergreen, the plants are better able to bear a lengthened period of drought without shrivelling to the extent which proves injurious to the foliage.

These, then, are my reasons for coming to the conclusion that with epiphytic Orchids attention to heat, air, light, and moisture is the essential of satisfactory cultivation. I have endeavoured to express some of my convictions as to how these conditions can best be made

F F 2

use of in order to induce a satisfactory condition of growth under unnatural conditions. Nature cannot be improved upon, and our efforts must, therefore, be limited to an endeavour to imitate her ways. To what extent we succeed, or have succeeded, up to the present you all know. Any measure of success we have attained should only stimulate further endeavours.

There are, no doubt, some plants that all but refuse to conform to the artificial conditions inseparable from cultivation, but it cannot be said, generally, that epiphytic Orchids are tender or unmanageable. On the contrary, it has been proved that when properly cared for they continue to thrive, and keep up a healthy existence, sure evidence that observation and attention on the part of the cultivator have been well applied. We have all experienced the peculiar satisfaction of attaining a desired object when success or failure has been hanging in the balance.

It requires, however, no great amount of observation to see that these epiphytes, which will often bear a great amount of bad treatment before being killed outright, must have their nature studied, and be given treatment suitable to their requirements, before they are capable of being grown to the healthy and vigorous condition so much desired. Plants that suffer either from neglect or mismanagement must obviously be long in recovery, even if death does not bring them to an untimely end.

Discussion.

Mr. O'Brien: I have listened to the able paper given by Mr. Alexander with the greatest pleasure. It is, I think, the best paper on Orchid cultivation ever read before the Royal Horticultural Society. Some fifty years ago I had myself the honour of having charge of the Westonbirt collection in the time of the late Robert Stayner Holford, father of Sir George L. Holford, who is present with us this day, and who has endeared himself to Orchidists no less by his love of horticulture than by his courteous manner towards all who are interested in the subject. I know that at Westonbirt the plants had pure air and a good light even in winter, but even these advantages are of little avail unless good cultivation and constant care are given. It is not necessary to praise the successes of the Westonbirt collection; the magnificent groups in the Hall at the present time, and those which have frequently been staged for years past, show that no higher standard could be obtained and no better exponent of Orchid culture found than Mr. Alexander. I should like to emphasize the remarks made as to the necessity of severing or removing old back bulbs, which only impoverish the leading and actively rooting growths to the detriment of the flower development. I should also like to support most heartily the remarks on careful watering. If too much water is given it interferes with root-production, especially with such Orchids as Cattleyas and Laelias. If over-watered these Orchids make but little root and rapidly decline in vigour.

The thanks of the Royal Horticultural Society and of this Con-

ference are due to Mr. ALEXANDER for the very useful and interesting paper which he has placed before us.

Mr. J. FRASER said he was pleased to hear that Mr. ALEXANDER emphasized the importance of light and air to Orchids. Growing as they do in more or less elevated positions on trees and other objects, they were able to obtain a greater amount of light and air than they could get, as a rule, in glass-houses in this country. It did not follow that they were always exposed to intense sunshine, as that would vary according to their elevation on trees, and whether they were fully exposed or otherwise. Epiphytic Orchids were dependent on the atmosphere for the carbon of their tissues, which they absorbed in the form of carbon dioxide, present in small quantity in the air. They depended also on the air for their nitrogen to some extent, for he thought this might be absorbed by the roots when brought in contact with them by moist air. This nitrogen was in the form of ammonia, in exceedingly small quantity in the air. He had never heard of very important results from the use of manures for Orchids. He also stated that he once saw a fine batch of *Phalaenopsis*, with panicles of flowers three feet long, and being in very small baskets the grower put the latter into larger ones and packed them round with Sphagnum. The plants never flowered again, but gradually died. This he considered was due to the exclusion of a proper amount of air from the roots.

Mr. DE BARRI CRAWSHAY said it would be very interesting to know when Mr. ALEXANDER took charge of the splendid examples of *Vanda coerulea* exhibited in the Hall downstairs. Most of those who attempted to grow this plant had failed to do anything like Mr. ALEXANDER had done with it. Another point that struck him during the reading of the paper was the remark that conditions were different in almost every house in which Orchids were grown. He thought this important point was not infrequently lost sight of by those who sought explicit directions as to the times and frequency of watering, the necessary temperatures, and so on.

Mr. ALEXANDER said the first plant came under his charge thirteen years ago and was afterwards shown in the Hall downstairs, but suffered subsequently from chill. Those now exhibited had come under his care for the most part between five and ten years ago.

Sir H. J. VEITCH asked Mr. ALEXANDER what other Orchids he grew with the *Vanda coerulea*.

Mr. ALEXANDER said that, speaking generally, the plants had a house to themselves.

Sir H. J. VEITCH remarked that he thought that explained a good deal in the success of their culture, as Mr. THOS. LOBB, the first plant collector sent to the East by his firm, and certainly one of the most successful that had ever left England, said he always found the best plants of this *Vanda* growing on single trees in the open cultivated fields, the plants there being very superior to any found growing in plantations, thus showing that the more air and light they had the

better. Mr. Lobb always said that one of the most striking sights he could remember was seeing a number of soldiers marching down from the hills with spikes of this beautiful Orchid entwining in their head-dresses.

Mr. W. Cobb asked whether an exception was not made with regard to the application of manures in the case of Cymbidiums.

Mr. Alexander replied that Cymbidiums certainly responded well to the application of manure.

Mr. McBean inquired at what time of year Mr. Alexander commenced to shade *Vanda coerulea*, and when he begun to expose them to full light in the autumn.

Mr. Alexander said that he usually found it necessary to afford some shading towards the end of February, and did not expose the plants to full light until about the end of September, or early part of October.

Mr. W. H. Hatcher asked what was the minimum winter temperature for *Vanda coerulea* at Westonbirt.

Mr. Alexander said 50° during severe weather, when the moisture must be kept in accordance with the heat, this being the most important point.

Mr. Gurney Wilson expressed the pleasure it had given him to listen to the able paper just read, for he firmly believed the methods advocated were the best—as indeed they all must, when they remembered the splendid health and vigour of the plants in the Westonbirt collection. He thought all growers would reap better results if they studied more carefully the various climates in which Orchids had been collected. He felt sure Orchids grown under the conditions advised would withstand without injury a far wider range of temperature than that to which they were usually exposed. One genus that had proved very difficult was *Sobralia*, and scarcely anyone had really succeeded with it.

Mr. W. Cobb said that the Sobralias grew and flowered well in his houses at Rusper, where they were grown in the Odontoglossum house on the top centre stage. They were reported every two years.

The Chairman, in winding up the discussion, said it seemed to him that one of the causes of failure among ordinary growers was that they tried to grow different kinds of Orchids in one house. The result was that if a particular method of cultivation was used, certain kinds would go forward while others would go backward. He thought the whole course of that most interesting paper was to point to the fact that they ought to try and take up smaller subjects and do them thoroughly well, according to the advice given them. He had himself some very large plants of Sobralia, which grew all the year round, and he never could give them a time of rest. If Mr. Alexander could have told them how he would suggest to keep back the growth of the Sobralias he should have been very much obliged to him. Meanwhile, on behalf of that Conference of the R.H.S., they thanked him very much for the paper he had read that day.

He would next ask Mr. R. G. Thwaites to read his paper on

"ALBINISM IN ORCHIDS."

Mr. R. G. Thwaites: It is with feelings of considerable diffidence that I venture to bring forward the subject of "Albinism in Orchids" for your consideration, not only because the subject itself is a difficult one and contains points which are still very largely matters of opinion, but more particularly because I am unable to treat it from a scientific point of view.

I am further conscious that I am speaking before experts who have had considerable experience with albino orchids; but, bearing in mind that this meeting is a "Conference" at which opinions and experiences are invited in order that sound conclusions may be formed, I am merely taking my part in the Conference, hoping to be able to throw a little light upon the subject.

After considering the definition of albinism, I propose to put before you the details of my experience with albino Orchids, the conclusions I have formed from such experience, and the reasons for such conclusions. These are offered in no dogmatic sense, but merely as opinions for your consideration.

Being desirous of raising white Orchids from seed, and having frequently obtained coloured flowers from the seedlings which I expected to flower white, I have turned to various writings upon the subject, hoping to benefit by the knowledge and experience of others.

I find these writings consist mainly of records of results (principally amongst Cypripediums), obtained in various gardens, and theories put forward to account for the mysterious happenings which have taken place, not always under the writer's own observation.

I must confess that I have found some of these theories very difficult to follow, and have often been mystified rather than helped by them.

For instance, I read: "It is now definitely established that the production of colour depends upon two factors which must both occur in one plant before the flowers can become coloured. In the two white forms these factors were segregated, hence the absence of colour in the two plants; but when crossed the two factors unite, and a coloured form results."

As I understand it, a white flower called "A" will mate with a white flower called "B" and produce white progeny, but when "A" is mated with a white flower called "C" coloured progeny are produced, because the factor which is in "A" differs from the factor which is in "C." Now, if there is a factor in "A" and "B" which is not in "C" it follows that there are two whites, the component parts of which are different, notwithstanding that all three flowers are admittedly white; but I cannot find an explanation of how the component parts differ one from the other, or how the factor which is in "A" and "B" compares with the factor which is in "C."

There is nothing to distinguish these two whites by, except the

mysterious results, and then only after years of waiting, when the results are self-evident.

Although this theory gives us only two whites (which to the eye are identical), there are also flowers admittedly white, which to the eye are different.

In the book, "Répertoire de Couleurs," obtained in the offices of the R.H.S., there are shown (amongst others) Pure White, Snow White, Milk White, and Cream White, which when viewed side by side are distinct from each other, but when viewed separately each of them would pass as white; *but* as their component parts must differ (or we could not detect any difference), so must the factor which they each possess, and so we are faced with a complication which might unite not two, but several factors.

Further, if the white flower "A" combines with the white flower "B" to produce another white flower, and will also produce white with a white flower called "D," then if "A" and "D" are mated the progeny should still be white.

Now, if "A," "B," and "D" represent individual plants only, the scope is very limited.

If, however, they represent a class, one foresees danger in making use of the theory.

Cattleya Trianae alba is notoriously inconstant, and the plant in one collection does not necessarily contain the same factor as the plant in another collection, unless it is a sub-division of the same plant. Theories are sometimes formed upon the evidence of others, and in getting evidence together one has to rely upon the judgment of others, who, without the least intention of misleading, may record a flower as white which is not white.

So much does the opinion as to what is white vary that one sees plants in flower exhibited as white which are distinctly flushed with colour upon the sepals and petals.

One recognizes of course that there must be factors, for without them there could be no products, but the suggestion that the whole range of whites in Orchids is covered by one of two factors appears to me to be hypothetical.

The theory that "an albino Orchid is distinguished from a coloured one by the absence of purple sap" is one which carries us beyond the sphere of *white* Orchids, and seems to have been propounded in order to account for the vagaries of *Cypripedium insigne Sanderae*, *C. Lawrenceanum Hyeanum*, &c., which have been classed as albinos.

This definition may serve a useful purpose in assisting the Cypripedium raiser, but, as it includes yellows and greens, it appears to me to cover too much ground to be useful to those raisers who are endeavouring to obtain white Orchids from seed.

When one contemplates mating one Orchid with another the mind looks forward and imagines that the colours one sees in the proposed parents will be so blended together as to produce in the flowers of the seedlings the same results as are produced by the blending of

pigments in art, or the colours of the spectrum, and (in a broad sense, bearing in mind that some colours are more powerful than others) I believe that the same combination of colours takes place in Orchids.

The dictionary definition of white is "reflecting to the eye all the rays of the spectrum combined," that is to say, "having all the constituent colours so blended that no colour is predominant," and I believe that this is the correct definition of the white in Orchid flowers.

Now, whilst the perfect blending of all the colours of the spectrum produces perfect white, where the blending of the colours is not perfect, a perfect white is not produced.

The synthetic white of the physics laboratory produced from pigments resembling all the colours of the spectrum, and combined, does not give perfect white.

In the same way there are various whites in Orchid flowers comparable to Paper White, Snow White, Milk White, and Cream White, each of which is distinguishable from the others.

In a lecture at the Central Technical College, Sir William Abdy caused to be thrown upon a sheet, by means of a lantern, three superimposed photographic pictures, projected through three coloured screens, thereby obtaining a coloured picture upon the sheet. The white objects in the view which had been photographed were reproduced white upon the sheet, notwithstanding that the light had passed through three coloured screens; that is to say, white (not necessarily perfect) had been produced by means of colours.

Now, considering that almost every Orchid known to us has a white variety, there must be some logical reason for its existence, and if the perfect combination of colour produces white, I think I am justified in concluding that it is the combination of colour which produces the white (more or less perfectly) in Orchid flowers.

This opinion seems to drive me still further away from the desired object of obtaining white Orchids from seed, because I can never hope to blend red, yellow, and blue flowers by crossing so perfectly as to produce white flowers.

Experience, however, tells me that white can be built up by choosing purple flowers upon one side and yellow upon the other, and the fainter the purple colour is, not only the more nearly do the flowers of the seedlings approach white, but the proportion of white over coloured flowers is greater.

The parents of the following examples contain purple on the one side and yellow upon the other, and the nearer these colours are to pure pale purple and pure yellow the greater is the proportion of whites obtained.

Dendrobium Wiganiae xanthochilon, crossed with *D. Thwaitesiae*, produced flowers, some with rose, some with violet, some with yellow, and some with white sepals and petals—showing that there were not only two, but several, factors involved.

The same results were obtained by crossing *Dendrobium Wiganiae*

xanthochilon with *D. rubens*, whilst from *D. Wiganiae* crossed with *D. Wiganiae xanthochilon* a number of the seedlings raised had either white or cream-white sepals and petals.

Dendrobium Findleyanum crossed with *Dendrobium Wiganiae* produced the same results, except that in the white varieties there was a faint trace of colour on the tips of the sepals and petals.

Cattleya Dowiana aurea crossed with *C. Trianae albens* produced *C.* × 'Maggie Raphael,' with whitish sepals and petals, in very large proportions.

I believe that all white Orchids in nature are produced from colour, their scarcity being due to the rare chance of nature selecting and blending the colours so as to produce white.

So soon as one attempts to obtain white seedlings from white parents there is considerable disappointment. Whites mated together will sometimes produce white, but coloured flowers have frequently resulted.

The following parents have flowered white year after year and have (without exception) produced white progeny:—

Dendrobium nobile virginale fertilized with its own pollen.

Cattleya labiata alba crossed with another *C. labiata alba.*

C. Mossiae Wageneri fertilized with its own pollen.

C. Mossiae Wageneri crossed with another *C. Mossiae Wageneri.*

Laelia praestans pumila alba fertilized with its own pollen.

C. intermedia alba crossed into *C. Mossiae Wageneri.*

I have never had white and coloured flowers from the same crossing of whites. The results have always been all white or all coloured.

The following produced flushed flowers without exception:—

Dendrobium Wiganianum album crossed with *D. nobile virginale.*

Cattleya labiata Amesiana crossed with *C. labiata* 'R. I. Measures.'

C. Schroederae alba crossed with *C. Mossiae Wageneri.*

C. Gaskelliana alba crossed with *C. Harrisoniana alba.*

C. Gaskelliana alba crossed with *C. Mendelii alba.*

All these crosses were made in the hope of obtaining white flowers.

In the light of after experiences, however, the explanation for the disappointment appeared.

Although the *Cattleya Harrisoniana*, the *Cattleya Mendelii*, and the *C. Schroderae* were, so far as the eye was concerned, the true albinos of their class at the time they were used as parents, upon flowering them, later, all of them were seen to have a slight flush of colour, that is to say, they were not fixed whites, and had reverted towards their type. The *D. Wiganianum* was not a true albino in that although it received an **A.M.** as *D. Wiganianum album*, it had two faint lines of colour in the throat, and both the *Cattleya labiata Amesiana* and the *Cattleya labiata* 'R. I. Measures' had coloured lips.

As an instance that it is possible for a plant to flower white one year and coloured another, and to exonerate myself for allowing these failures to be recorded as failures to obtain white from white, I call

your attention to the plant *Cattleya Trianae* 'Mrs. Edward Sondheim.' The flowers of this plant when I first saw them were pure white, and, as such, received a **F.C.C.** from the R.H.S.

The drawing which was made of it at the time shows it as a pure albino, but it has since flowered coloured.

How, then, is one to account for this reversion towards the type? I believe that the colours one sees in Orchid flowers are produced upon the surface of the flower by the chemical action of light and air. The plant contains selected coloured sap; this is drawn up through the stem to the bud, and is split up along the veins upon the surface of the flower. This sap by the process known as ripening is made more or less responsive to the action of oxidation by light and air, and the varying richness of the colours obtained in the flowers depends upon the amount of light and air admitted to the plant during the ripening period as well as the final stages of the flowers' development.

When a plant produces flowers of richer colours than previously, we say "this is due to good cultivation," and so it is. The riper the plant, and the more light and pure air available for the cultivators' judicious use, the richer will the colour sap be, and the more noticeable will be the chemical change of the sap in the veins upon the surface of the flower.

A plant which has flowered white one year, and slightly flushed the next, may be made to flower white again by opening the bud in the dark, and so preventing the light from producing a chemical change in the sap.

I believe that plants which flower white one year and flushed another year possess in themselves a small quantity of colour sap, which is observed in the colour of the flower *only* when sufficient oxidation has taken place.

Only those plants which flower white year after year under good cultivation may be looked upon as "fixed," and are the only safe plants to use for producing white progeny.

When albinos (so-called) will not intercross to produce white, I would attribute the reason to one or both of the parents containing colour sap, and by the same reasoning I commit myself to the belief that all true albinos will intercross with their own class to produce white.

In closing this paper I would ask all who are interested in Orchids to use their endeavours to stop the careless, misleading, and too frequent use of the word "alba" as applied to plants which have no right to the description.

By this I do not merely mean flowers with coloured lips, but I particularly refer to those flowers which are distinctly flushed with colour on the sepals and petals, and are still labelled "alba."

To record such plants as white make it very difficult to arrive at logical conclusions, and is particularly unfair to those who by their writings are endeavouring to assist the raiser, and who must have accurate data from which to work.

Discussion.

Mr. Rolfe said it would be interesting and valuable if something reliable could be ascertained about the subject of albinism. Albinism was a quality—a very beautiful quality—and no doubt it arose from the absence of colour, but there was the difficulty that some albinos reproduced themselves true when selfed and yet reverted to coloured forms when crossed. Both *Cattleya Warneri alba* and *C. Gaskelliana alba* were true albinos, as far as could be ascertained by examining the flowers, but when crossed together some of the resulting seedlings were pure white and others light rose, showing that a latent colour factor had been revived. In the case of *C. intermedia* × *C. Mossiae Wageneri*, however, the whole batch (*C.* × *Dusseldorfei* 'Undine') was white. *Cypripedium insigne Sanderae*, when crossed with *C. callosum Sanderae* or *C. Lawrenceanum Hyeanum*, gave rise to coloured hybrids, yet all three came true when selfed. *C. insigne Sanderae*, however, though one of the best yellows, was not a true albino, for it showed minute brown spots on the dorsal sepal, and the effect of crossing was to stimulate their development in the hybrids, the effect being much the same as if ordinary coloured forms of *C. insigne* were used. The effect of crossing was to revive a latent factor, and of course when plants were selfed no new and disturbing element was introduced. But even when plants were selfed the offspring were not always uniform. Messrs. Veitch had raised a batch of *C. insigne Sanderae* by self-pollination, and though all came yellow, they were not uniform in character. Flowers of five seedlings had been picked out and sent to him no two of which were alike, and in one the spots were distinctly more marked than in the original, while another was pure yellow, as pure as *C. insigne* 'Gladys,' and he could not detect a speck of brown or a coloured hair anywhere. Reversion as the result of crossing was not remarkable, for lost or latent characters might easily be revived. A plant might be regarded as made up of a host of characters which had been successively acquired, and some of these were evidently very ancient, while others were more recent. In the course of evolution new characters were constantly arising. In conclusion, he appealed to all those who were making experiments to send the results to the Press, as by so doing a mass of evidence would be accumulated that would be of the greatest value to orchidists.

Mr. Fraser said he had not given much attention to albinism in Orchids, but thought it was not always possible to get seedlings with pure white flowers, although both parents were albinos. It was frequently, if not always, impossible to tell what characters were latent in an albino till one commenced cross-breeding or hybridizing with it. He had collected many albinos of native wild plants, and, judging by the first white-flowered *Campanula rotundifolia* he had gathered, he contracted the notion that albinos must be more delicate than the type, owing to the loss of some character. There was a correlation between the colour of the flowers and all other parts of the plant, which were

pale. On another occasion, however, he found a large colony of *Gentiana campestris*, every one of which was an albino. These plants must have been breeding true to an original, and most of them were unusually vigorous.

Major HURST said it was very interesting to know that one or two of these so-called albinos that they had been relying upon as evidence had changed. He should be very glad indeed to follow up that phase, because the special plant mentioned by Mr. THWAITES he examined most carefully, and had been unable to find any trace of colour in it. There still remained a large number of albinos which remained albinos throughout their lives. With regard to Mr. THWAITES' suggestion as to the origin of white, there was the sporting suggestion that white was due to the mixing of colours. When they were dealing with pigments white had nothing to do with the absence of colour. All they meant when they said an "Albino Orchid" was that the sap colour was absent from the flower. He had, in reading his paper, left out that portion which would have dealt with the question because he thought Mr. THWAITES would deal with it. But they would see his full paper (p. 422), so that they could compare the different points of view. He was pleased to see that Mr. ROLFE was coming round to their point of view; for a long time he would not have anything to do with Mendelism, or anything of that kind. [Here Major HURST gave portions of his tables referring to albinos.]

Mr. FLETCHER asked how the results referred to in his paper by Major HURST were produced.

Major HURST said it had been proved by demonstration in the case of sweet peas and stocks, and also in the cases of several other plants. Of course in Orchids they could not raise albinos in thousands, but in the case of the Belgian albinos, to which reference had been made, he thought it was something like five to three. At any rate it was quite near enough to those figures for practical purposes.

Mr. THWAITES said that whether they differed at the present moment as to the definition of albino was immaterial. His definition was the dictionary one of white.

Major HURST said the definition of albino he had presented was not his own, but was simply the definition that had grown up through all the years of experience and practice in the Orchid world. For growing and practical purposes the beauty and purity of an albino depended upon the absence of purple or red colour.

Mr. BATESON called attention to the curious problem presented by the distribution of colours in the varieties of *Odontoglossum*. Inasmuch as the brown colours are evidently due to the combination of a purple sap colour with a yellow (presumably due chiefly if not exclusively to presence of yellow plastids), as in wallflowers, &c., it is a paradox that *brown* spots may occur on a *white* ground. We should expect *either* that all spots on a white ground would be purple, or that if the spots were brown there would be yellow spots or yellow

edges associated with them. In certain forms yellow spots do occur on a white ground, without any admixture of purple or brown. This, however, is natural enough. But since brown spots on a white ground may occur without any separate yellow marks, the fact must be taken to mean that the distribution of the purple and of the yellow in such cases coincides, with the result that the spots are brown though the ground is white. Since, however, the factors responsible for the purple and for the yellow respectively must surely be genetically independent, this coincidence is remarkable. There are often of course purple spots in addition to brown ones, but no separate yellow spots, or even yellow edges, to the brown spots in these cases.

The CHAIRMAN said that if the members of the Conference would send a number of examples of Odontoglossums to Professor BATESON, perhaps he would be so good as to contribute a paper on their colour arrangements at a future Conference.

Sir GEORGE HOLFORD did not think the Conference should break up without one point being well rammed home, and that was that Orchids could not be grown to perfection unless the houses were suitably built and properly placed—matters which were sometimes overlooked. Sometimes gardeners were blamed for not being able to produce the proper thing, but he would urge strongly that those who were building more glass should carefully consider where they were going to put up that glass. In his own case, when he put up a new block of houses he was persuaded by Mr. ALEXANDER to choose an open field where there was plenty of fresh air and no trees near. He strongly urged those present to be very careful when erecting new glass to erect it in a suitable position. In conclusion, Sir GEORGE HOLFORD proposed a vote of thanks to Mr. GURNEY FOWLER for presiding that day.

Mr. DE BARRI CRAWSHAY seconded the motion, which was carried with acclamation.

Mr. GURNEY FOWLER, in acknowledging the vote of thanks, brought the Conference to a conclusion, and said he had found it most interesting, as no doubt others present had. He quite agreed with Mr. THWAITES, whom they desired to thank, as to the need for the utmost care in breeding Orchids; and in naming them, to give a plant the varietal name of "alba" unless it was a pure albino was greatly to be deprecated.

FIG. 149.—PHYLLOSTACHYS SULPHUREA, *A. and C. Rivière.*
Cuttings. (p. 447.)

[*To face p.* 446.

Fig. 150.—Saxifraga Brunoniana, *Wall.* (p. 449.)

PROBLEMS OF PROPAGATION.

By Prof. I. Bayley Balfour, F.R.S., V.M.H.

[Read June 4, 1912; Sir Daniel Morris, K.C.M.G., V.M.H., in the Chair.]

[Being the eighth "Masters Lecture."]

"Problems of Propagation" is a comprehensive title for my lecture, and I will therefore at the outset relieve expectation by saying that I propose to address you to-day from a definite text. I read in a recently published book this: "It is well known that many plants—*Pinus*, for example—cannot be propagated from cuttings."

If that statement be correct the question is raised—Why is it so?

If the statement be incorrect we may as fairly ask—Why is it so often made?

Whether correct or incorrect the statement is one to which a large part of the gardening world will subscribe—and in many cases on the ground of practical experience.

The importance of the point involved in the statement has been brought home to me recently with some force.

Last year a large nurseryman with an extensive business in West Scotland, showing me a multitude of young grafted plants of the charmingly graceful *Gypsophila paniculata flore pleno*, asked if I could tell him why it was impossible to propagate the plant by cuttings. I had not heard until then of the difficulty—although I have learned since that it is frequently experienced—and could only promise to make a trial in the Royal Botanic Garden, Edinburgh. As matter of fact the plant can be struck from cuttings—from internodal more rapidly, perhaps, than from nodal. What is the obstacle elsewhere I have yet to discover.

Shortly before this I had learned from the Chief of the Bureau of Plant Industry of the United States Department of Agriculture that propagation of bamboos by cuttings had not been successful, although their ready increase by such a method would have a deep bearing on their distribution in America. Yet bamboos, like other monocotylous plants of similar growth-form, can be readily increased by cuttings. (Fig. 149.)

I mention these incidents for the purpose of showing that the idea underlying them—certain plants cannot be propagated by cuttings—is not confined to amateur gardeners, and also by way of explaining why I have selected as my theme the subject indicated by the title.

I believe the statement in my text is wrong. I believe that all plants can be propagated vegetatively by cuttings—some easily, some with more or less difficulty; and, therefore, in view of the widely spread impression to the contrary, I think it is worth while to endeavour to remove the misconception. No more appropriate opportunity could

come to me than this occasion when we commemorate the service to horticulture of Dr. MASTERS, whose life was devoted to establishing a solid groundwork of scientific truth for the practice of horticulture.

It must be said at the beginning that, for practical gardening purposes, vegetative propagation of many plants by cuttings is a matter of no moment—it is not worth while. With free seed production the perpetuation of a species is sufficiently provided for. Where, however, some particular variation has to be preserved and a race established, multiplication by cuttings is the most economical method for obtaining the desired result. The knowledge that there is no reason why every desirable plant should not be perpetuated and multiplied by the vegetative process of cuttings—provided that insistent requirements are properly attended to—ought to be an encouragement to all gardeners, and should stimulate further endeavour with difficult subjects of the plant world. "It can't be done," in reference to such propagation, is a phrase that should not cross the lips of a gardener.

In order to make plain the soundness of the view I have expressed and wish to sustain I must in the first place recall the construction of an ordinary flowering plant so far as it relates specially to this question.

The essential thing to remember is that the plant is composed of a sheet of protoplasm (living substance) stretched over a skeleton. From root-tips to stem-tips and leaf-points there is this living substance distributed in plant-cells—some in more active state, some in less active state, but each cell having it to start with and retaining more or less for a time the potentialities of every other cell. The plant is in fact a colonial organization. From the standpoint of my lecture this requires saying, having in mind the modern phase of proleptic interpretations of the plant body.

In ordinary conversation we speak of a plant as an individual, but it is not an individual in the sense in which one of the higher animals is an individual. From such an animal individual no part grows up into a new individual, no part can be removed without mutilation. Its organs are highly specialized, and for its individuality it pays the penalty of being mortal. From the colonial plant, on the other hand, parts may be removed and others are formed to take the place of those removed, and a removed part may form an entire new plant again. A new plant may grow up from anywhere: sucker shoots on roots of cherry, for example, young plantlets on the margin of leaves of *Bryophyllum*, are familiar objects in gardening. All this is possible because every young active cell has the capacity of every other cell, and the plant is potentially immortal.

Take the case of an *Iris*. It creeps along in the soil forming additions to its body, branching, growing onwards, whilst its older parts die off. As these die to the base of branches the branches become independent plants—natural division. If accident be excluded there is no reason why the plant should not live for ever.

Apply to a forest tree the conception thus derived from an *Iris*.

Fig. 151.—Dentaria bulbifera, *Linn.*
Bulblet in axil of leaves.

[*To face p.* 448.

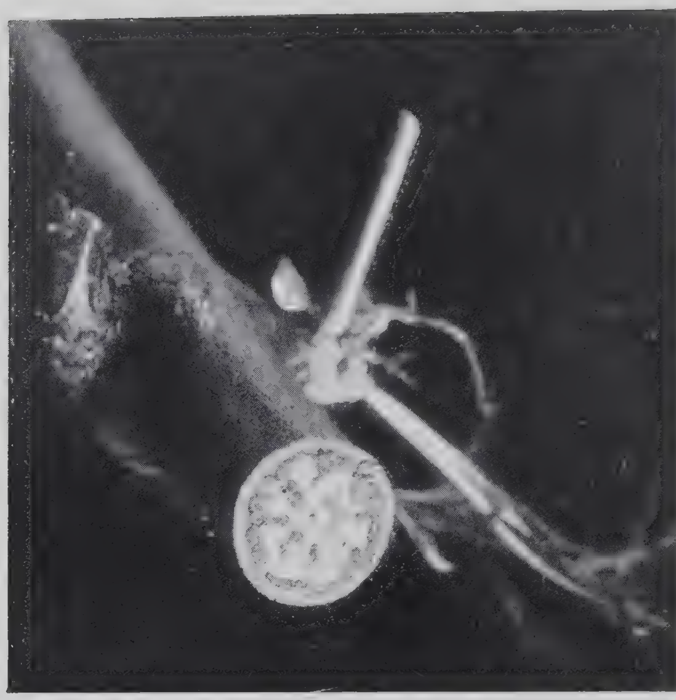


FIG. 155.—ANEMOPAEGMA RACEMOSUM, *Mart.*
Callus from cortex and medullary rays.

FIG. 156.—RUDGEA MACROPHYLLA, *Benth.*
Callus from wood cambium.

[To face p. 443.

The extension here is into the air, but it is of the same character. There is dying off behind of old parts in the heart of the tree and in the bark that is shed, but a support remains for the copious canopy of branches and leaves. Of the great age reached by some trees we are all cognizant.

There is, then, in the constitution of the plant everything conducing to perpetuation by a vegetative process.

If we wish to utilize the organization of the plant for multiplication of individuals it is from Nature herself that we must learn in the matter of vegetative propagation, and all our practice must be based upon and developed out of the principles that we see in operation in Nature.

Let us take a simple illustration in, say, the strawberry or a plant like *Saxifraga Brunoniana* (fig. 150). Here long branches are sent out trailing on or over the surface of the soil. The bud in the axil of each small leaf on such a branch is nourished by the mother-plant at first. Then the stimulus of moisture at the position of the bud where it touches damp soil evokes the formation of roots below it, the bud shoots out into a branch, absorbs food for itself by roots from the soil and leaves from the air, and becomes an independent plant, ultimately losing connexion with the mother-plant through withering and breakage of the linking portion of branch. In this we have a process of normal vegetative propagation in Nature—natural layering—and you will note these conditions:

(*a*) The young bud receives an ample food-supply from the mother-plant until it has rooted itself.

(*b*) The roots develop in response to the prolonged stimulus of water and at the expense of food supplied by the mother.

These two facts are primary. They underlie all vegetative propagation. Without food-supply, without water, vegetative propagation is impossible. The gardener has to secure the presence of both of these if he is to succeed in any propagative venture.

Features similar to those which I have cited are often seen in large trees of which some of the branches have reached the ground. They are still attached to the mother-plant, but at the point where they touch the ground the stimulus of moisture induces the development of roots, and the end of the branch above this point is in fact an independent tree. The noted beech at Newbattle, and the remarkable specimens of Norway spruce at The Whim, in Peeblesshire, are conspicuous examples. What in the tree is usually self-extension in branching here becomes self-propagation, and the tree imitates the condition of many herbaceous plants.

In the strawberry and in *Saxifraga Brunoniana* and here in the tree the mother-plant does not part with the young offspring until the latter is self-established.

But see what happens in *Dentaria bulbifera* (fig. 151). In the leaf-axils there are the so-called "bulblets." What are they? Merely buds in which some scale-leaves have enlarged as stores of food-material, and

being thus supplied the mother-plant casts them early. In contact with water as a stimulus they form roots at the expense of food-material in the scale-leaves, and the bud elongates as an incipient shoot. The two factors—food-store and water-stimulus—are present here.

Ranunculus Ficaria offers an example of the same provision, only an early formed root serves as the food-store.

That such separable propagative bulblets or tuberous bodies of kinds are not nearly so common amongst dicotylous plants as amongst monocotylous ones is a fact of phyletic interest, and it is one, too, of practical import to gardening; without such bulblets, corms, and the like, our gardens would be deprived of the enrichment they derive through the free and rapid propagation of monocotylous plants.

But Nature proceeds in another way at times. Supposing an injury has been done, say, to a branch by which it is broken off near the base. Nature tries to protect the wound and repair the injury by the familiar process of forming a callus. If the stump of the branch be too long this is ineffectual and rotting passes down the broken branch to the centre of the tree (fig. 152). But if the stump be short (fig. 153), or if we assist Nature by clean cutting the base of the broken branch as sound pruning requires, the callus covers the wound entirely, all trace of which disappears, and from the margin of the healing cushion there may be formed many small shoots—miniatures of the branch that was lost. From the callus formed all round the margin of the clean-cut stump of a tree felled for coppice many stool-shoots may arise (fig. 154), and the tree may in time through one or more of these replace the head that has been removed.

This callus is of supreme importance in relation to vegetative propagation. It consists of a quantity of indifferent meristem-cells—cells, that is to say, which are capable of dividing and multiplying, but whose fate has not been definitely determined. Circumstances and relative position will determine that. Callus may arise from any mass of living cells under the stimulus of wounding.

In an ordinary dicotylous stem or root it may take origin in the pith, in the medullary rays, in the cortex, or in the active wood-cambium, and it forms lobulated projecting masses at the point where it occurs (fig. 155). Perhaps in most cases the wood-cambium is the most important seat of its formation (fig. 156). Callus more rarely forms in monocotylous plants—they are content to heal wounds by a cork covering only; when it does appear it arises from the cortex of the stem. Leaf-callus comes from around the veins.

In all situations callus has the same potentialities. It is a wound-protecting tissue to begin with, but its cells may be absorptive and may also take on the work of restoration of the plant-body by producing organs that have been removed by wounding. It is a mark of the colonial organization of the plant.

In the light of knowledge of the facts to which I have referred, the gardener has to solve the problem of propagation by cuttings.

Multiplication by division is merely the following of Nature's own process as seen in the increase of an *Iris* when, through the dying off of its older parts, separation of its newer ones occurs.

Multiplication by layering is copying Nature by putting a mother-plant in a position in which its shoots have ample opportunity of rooting at the nodes, and so initiating new plants.

But multiplication by cuttings means the isolation from their previous food and water supply of parts not specially prepared to lead an independent existence, and the art of the gardener is devoted to calling out the exercise by the severed part of the plant of potentialities in the direction of wound-protection and organ-restitution. His problem is how to secure that the part used as a cutting retains adequate moisture until such time as new water-absorbing organs are formed through the utilization of such food-material as is already in the cutting, or which it may acquire. The water-relation is the primary one. Once the severed part provides itself with the means of getting a continuous water-supply it is in the state known as "struck." Further development is a matter of time, and, although often slow, is open to hastening by appropriate stimuli.

The variety of constitution exhibited by plants makes the problem one of some complexity. Certain plants—the so-called soft-wooded—offer no difficulty. In them there is abundant water applicable to callus-growth. Hard-wooded plants frequently are difficult—and the reason is obvious. The key is in the water-relation. For other reasons, which I shall afterwards refer to, resinous plants and those that are rich in the milky fluid called "latex" may also be difficult subjects for propagation by cuttings.

The most common method by which the gardener propagates by cuttings is that by stem-cuttings, and the operation is familiar.

Take an ordinary example of a dicotylous plant (fig. 157). A short terminal portion of shoot with one or more buds is cut off from a mother-plant, and the cut end is placed in a nidus of sand or other sufficiently aerated material. Sooner or later, if the cutting is inserted at a right depth so that aeration is adequate, callus forms as the result of wound-stimulus on the basal end of the cutting in the soil. Then roots emerge either from the callus alone, from the stem above the callus alone, or from both. The stimulus may therefore spread from the point of its application. The cutting is thus established as an independent plant. The portion of shoot placed in the soil elongates at the top from the terminal bud or upper lateral buds if there be no terminal one, forms more branches and leaves, and we get simply an extension of growth of a shoot which is now no longer attached to the mother-plant. There is special interest in this, contrasting as it does with the behaviour of monocotylous plants to which reference will be made presently.

Commonly, a stem-cutting includes at least one node, because it is there that a shoot-bud actually in evidence or latent will be found, from which the new extension will proceed. But in some plants,

species of *Acanthus* for example, such selection is unnecessary. Any portion of an internode may be used as a cutting. In such cases the shoot-bud for extension is an entirely new formation from the callus, as it is in coppice.

There has been much discussion over the question—ought the leaves at the base of the cutting to be removed or not? Some propagators remove them, others prefer to leave them. I know of no definite comparative experiments bearing on the advantage of one practice over the other, but the practice of leaving them has these advantages:

(*a*) The cutting is saved the healing of the wound caused by their removal.

(*b*) The lower leaves sunk in the soil may root like the stem and aid thereby water absorption.

(*c*) The lower leaves will aid in the manufacture of food for the cutting.

In many cases retention or removal is probably of little moment, but the choice might be critical in a particular species, and the point ought, therefore, to be in the mind of the gardener.

The place on the stem of the mother-plant where the severing cut for the base of the cutting is made is of importance in some species. It may make all the difference between immediate, belated, or no success. Commonly the section is made at the node—nodal cuttings—and for most plants this seems to be satisfactory. There are, however, plants which propagate far more readily if the cutting be made through an internode—internodal cuttings.

Clematis may be cited in illustration. The common belief is that species of this genus are difficult to strike, and propagation by grafting and other methods is frequently adopted. They are really not difficult to strike from cuttings if the cutting be made through an internode. (Fig. 158.) Internodal cuttings may be struck within a fortnight. It is otherwise if nodal cuttings are used. These callus well, profusely indeed, but refuse to form roots either from the callus or from the stem above it. Doubtless this has given rise to the widely spread belief that it is difficult to strike cuttings of *Clematis*.

Why there should be this difference between nodal and internodal cuttings is one of the problems of propagation which we have yet to solve.

It is well known that once callus-formation is started at the base of a cutting it often continues until a large nodular ball is formed. Some plants appear to possess this habit in a remarkable degree, and it is no uncommon experience to read that the cuttings of certain plants will callus freely but will not root, or only after so long a period—a couple of years or more is not an unusual time—that the patience of the propagator is exhausted before rooting occurs. *Lonicera Hildebrandtii* is a conspicuous example. (Fig. 159.)

If the fact be appreciated that the primary impulse to callus-formation is that of wound-stimulus, and that the stimulus spreads

Fig. 157.—Thyrsacanthus rutilans, *Planch.*
Rooted cuttings.

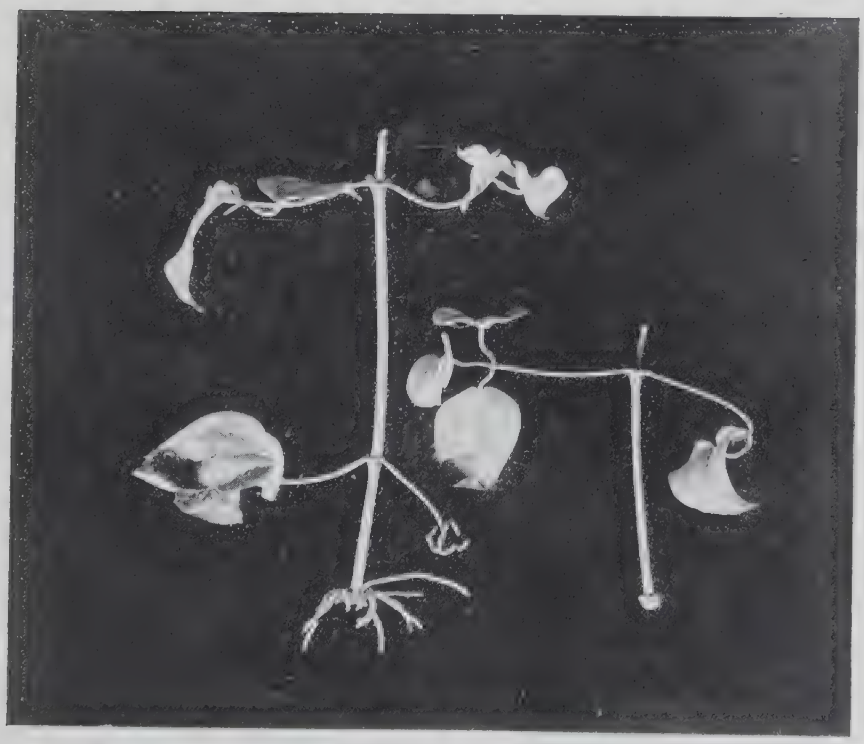


Fig. 158.—Clematis Armandi, *Franchet.*
On left: Internodal cutting rooted.
On right: Nodal cutting with large callus.

[*To face p.* 152.

Fig. 159.—Lonicera Hildebrandtiana, *Collett et Hemsl.*
Cuttings with massive callus.

from the point of section and induces root-formation beyond the area of the callus, one may find a means by which to overcome the influences that retard root-formation. The effect of intermittently repeated wound-stimulus is wonderful in the massive development of callus upon stems in positions where no special function beyond that of healing is required. Its effect upon callus where there is demand for new absorptive organs imperatively required for the life of a cutting is no less remarkable. The wound-stimulus induces root-formation. By paring off the surface of the callus-tumour it is possible to stimulate almost immediate root-development. If a first paring is ineffectual a second or a third may bring about the desired growth. Proteaceae, which are regarded as difficult subjects, readily respond to the stimulus of callus paring (fig. 161). The callus itself here forms the roots in the first instance. If one pares the callus of a nodal cutting in *Clematis*, roots are formed, but always from the inter-node above the callus.

In contrast with plants which readily and rapidly form an abundant callus—and that is characteristic of the soft-wooded—there are the dicotylous plants commonly called "hard-wooded," which are attuned to live in conditions where water is physically and physiologically scanty, and which, if they have enough to satisfy their requirements, live only by the exercise of the strictest economy of the resources available to them—*Erinacea pungens* and species of *Dillwynia* and other Australian Leguminosae, are examples.

In them, then, there is none of the lavishness observable in the soft-wooded, although the processes of striking are the same. The march of events is relatively slow. Wound-stimulus is not transmitted rapidly. The initiation of callus is late, is often not abundant, and formation of new absorbing roots is delayed. It is these elements that govern the difficulties encircling the propagation of such plants. Their drought attunement makes special demands for nice adjustment of aeration of the nidus. Their slow development prolongs the period during which these have to be satisfied. The double danger of wilting of the cutting from insufficient water and of suffocation from want of air becomes therefore very real. These considerations may suggest particular conditions that require attention in propagating such plants, and not the least important of these is the necessity of using as small cuttings as possible. Size of cutting is a matter of relatively less moment in the soft-wooded.

Another problem confronts the gardener when he attempts to propagate by cuttings plants which are full of resin as are so many of the Coniferae.

For long it was said, and even now it is said, as my text specifically shows, that propagation by cuttings of some conifers is not possible. That such propagation from the point of view of commerce is impracticable in the case of many coniferous genera we may admit. As a fact of science all can be propagated.

An obstacle in the way of commercial propagation by cuttings of

some of these plants—for example, species of *Abies* and *Picea*—lies in this, that the terminal shoot alone gives a good radially impressed offspring. The dorsiventrality of the lateral shoots is so engrained in the organism that it reappears in the product of a cutting from a lateral shoot. And so propagation by cuttings does not always spell multiplication. Then the fact that the Coniferae generally do not form callus freely has been advanced as the reason why they are difficult subjects for vegetative propagation. It is true that pines and firs do not develop stool-shoots, and our records of rooting branches of conifers are few—fewer than investigation will ultimately support, I believe—but all conifers form some callus. Far more of an obstacle is the resin. Deficient as they relatively are in the usual means—callus—which Nature provides for protection of wound-surface, this resin serves as a substitute or accessory means of protection. When present, the resin flows out copiously on an injured surface, covering it effectively with a hard skin. The significance of this in propagation is evident. Over the cut surface of the cutting and any callus formed there the resin hardens and constitutes a hindrance to the exit of young rootlets. What, then, is the propagator to do? Simply scrape off the resin-skin. Most resinous conifers, if treated after this fashion and under the application of the wound-stimulus of paring their callus, strike freely. But this is not the whole story for conifers, like *Pinus*, for example, from which the outflow of resin is copious. This exudation must be checked, and the simplest process is that of plunging the cut end of the cutting in nearly boiling water. The cut resin canals are thus sealed, and doubtless, at the same time, the heat stimulus promotes formation of callus. (Figs. 162, 163.)

Dicotylous plants with resinous and milky juice are in like case with conifers, and require to be treated after the same fashion.

The actual state of the shoot about to be used for a cutting requires attention in some cases. A vigorously growing shoot taken off a plant and at once placed in the nidus for propagation may fail to strike. Its vigour is too great. The food-material in the cutting is really required for the callus healing at its base. If the claims of the apex are so great as to deflect the food-supply, as may well be in the case I have mentioned, callus-formation and root-formation may be so delayed as not to forestall wilting. The soundness of the practice of allowing some cuttings to dry slightly before planting in soil is supported by this.

An interesting problem of propagation by cuttings is offered by monocotylous plants. They exhibit some striking features in which they differ from dicotylous plants, and I am disposed to think that the difference I am about to describe may be one of the reasons for the prevalent idea that some of these monocotyls do not propagate by cuttings.

In illustration, take the case of *Asparagus* or like plant (fig. 164). Here, as in monocotyls generally, a short terminal portion of the shoot will give no result as a cutting. A larger branched twig must be severed

for use. Placed in the required conditions, it exhibits phenomena fundamentally diverse from those shown by the dicotyl:

(*a*) First of all, no callus is formed. Only a skin of cork is produced to cover the wounded surface.

(*b*) Then no roots are sent out from the stem of the cutting.

(*c*) A bud in the axil of the lowermost leaf on the cutting (or of it and of the one immediately above it) begins to enlarge, and, as it does so, from its base emerge new rootlets. This enlarging bud is the beginning of the new plant that is to come from the cutting. As the bud spreads laterally it sends up aerial shoots, and, as these develop, the portion of mother-shoot used as cutting withers and dies off. It takes no share in the formation of the new plant (figs. 164, 165, 166).

This distinctive difference in behaviour of dicotyls and monocotyls seems to be no chance one. It belongs, I believe, to phyletic history, and is of the essence of the constitution of the two groups of plants Let me explain.

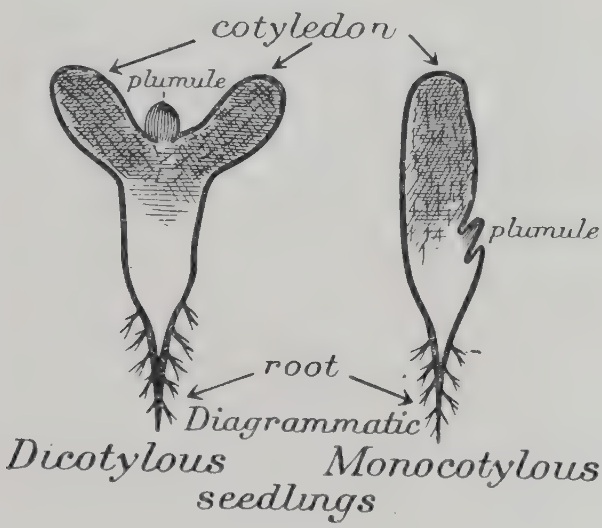


FIG. 160.

The cormic construction of the dicotylous plant shows us:

(*a*) The hypocotyl or body—central axis—of the corm.

(*b*) The primary root in line with, and at the basal end of, the hypocotyl.

(*c*) The suckers (cotyledons) two lateral extensions of the upper part of the hypocotylar region of the corm.

(*d*) The plumule—which is the primordium of the future aerial extension of the shoot of the plant, and it lies at the apical terminal point of the hypocotylar region.

Compare now the like parts in the monocotyl—there is:

(*a*) The hypocotyl.

(*b*) The primary root.

(*c*) One sucker (cotyledon), an upward terminal extension of the hypocotylar region.

(*d*) The plumule, which is here a lateral structure on the hypocotylar region. (Fig. 160.)

From the beginning, then, the dicotyl has the instinct of upward

terminal growth, and that means rapid growth. From the beginning the monocotyl displays lateral growth, and that means sluggish growth.

The habit thus early shown by these two classes of plants appears to be impressed upon them and reappears in the stages of vegetative propagation by cuttings. The terminal shoot of the dicotyl extends as the new plant from the rooted cutting. A lateral bud develops as the new rooted plant in the monocotyl and the terminal portion of the cutting dies.

We may emphasize further these relationships and contrasts by pointing out that whilst a wood-cambium such as occurs in dicotyls is generally absent from monocotyls, some tree and shrubby forms—for example, *Dracaena* (fig. 167) and *Witsenia*—make a wood-cambium of a special kind. Correlated with this divagation from the ordinary monocotylous type in the direction of the dicotylous the terminal portion of the shoot when cuttings are made elongates and forms an extension of the severed shoot after the fashion of the dicotyl.

Any root with adequate substance and food-supply may be used for propagation under suitable stimuli. Propagation by root-cuttings is governed by the same principles as are involved in stem-cuttings. There is, however, this difference in the plant part concerned. The root is an organ that is normally forming new branch roots—absorbent organs. Its reserve in respect of these is immense. What the gardener requires is that the severed root forms shoot-buds such as many produce when in normal relationship. The shoot-buds are new formations in the cutting. The cut surface of the cutting in dicotyls forms callus as in the shoot, and the bud may take origin in the callus. Otherwise the bud develops from the pericycle out of which daughter roots arise. There are here no nodes and internodes, as in the stem offering regions of selection. Any short portion of the root treated like an ordinary stem-cutting suffices. Through no feature of its organization is the consequence of the colonial construction of the plant more evident than in this propagation by roots.

Comparative experimental work with root-cuttings has not been extensive, and we have much to learn about the stimuli conducing to shoot-formation from roots. By the gardener the method has been found useful when propagation by stem-cuttings has been slow, for example in *Spathodia campanulata*, or difficult as in *Calycanthus*, *Cladrastis*, and *Ailanthus*, and in dealing with herbaceous plants like *Drosera*, from which stem-cuttings cannot readily be obtained.

Before leaving the subject of root-cuttings I ought perhaps to say that in the term " root " I refer to the true root. It is difficult when reading gardening literature to determine in many cases the sense in which the word " root " is used—whether as including all underground parts of plants or the root in its botanical sense alone.

We have seen how in Nature, for example in *Bryophyllum*, vegetative propagation may be carried on through the leaf alone, and I have described how a leaf may be ancillary to the stem in the case of a stem-cutting by assisting in the formation of roots if it be left at

FIG. 161.—GREVILLEA GLABRATA, *Meissn.*
On right: Cutting with exuberant callus.
On left: Cutting with pared callus rooting.

[*To face p.* 456.

FIG. 162.—PINUS AUSTRIACA. *Hüss.*
Cuttings showing wood-cambium callus.

FIG. 164.—ASPARAGUS MADAGASCARIENSIS, *Baker*.
Cuttings.
On left: Basal bud enlarged.
On right: Basal bud forming new shoot.

FIG. 165.—SMILAX OFFICINALIS *H. B. et K.*

The stem on right with large leaves is portion of mother-plant used as cutting. The stem on left, with scale leaves below and tendril-bearing leaves above, is the new plant from basal bud of cutting.

[*To face p.* 457.

the base of a stem-cutting. The leaf has clearly potentialities for use as a cutting itself. The fact is familiar in the multiplication of lilies from the scale-leaves of the bulb. It is a common garden practice. Here the leaf is a tuberous food-store. Moisture and other necessary conditions suffice to stimulate callus-formation at the severed surfaces whence the new plantlets arise, beginning always as bulblets.

Different as leaf is from stem, the process by which propagation takes place is the same. The leaf does not produce new leaves—it produces shoots. Given the possession of adequacy of active indifferent cells, that is to say, cells not already impressed with a definite morphological destiny, and of a sufficiency of food, then in proper conditions of moisture, aeration, and temperature any leaf may be used as a cutting. Nor is the whole leaf necessary—petiole alone, or lamina alone, or portions even of these may serve.

An illustration of the principles governing propagation by leaves is offered in Nature by *Zamioculcas Loddigesii*. The leaves when shed exhibit no particular feature indicating their special dedication to the purpose of propagation, but after fall they remain green and active, and the food-material they possessed at fall and manufacture thereafter, which in ordinary course would have passed down to the plant from which they have fallen, accumulates at the cut surface and is there devoted to the formation of a large tuberous callus from which roots develop, and thence a vegetative shoot-bud outgrows as the rhizome of a new plant.

The practice of using leaf-cuttings was more followed in the past than it is now; propagation of citron, lemon, and laurel by this method is of great antiquity. Nowadays, however, it is restricted by gardeners to a comparatively small number of facile forms—such, for example, as one finds in *Begonia*, Melastomaceae, Gesneraceae, Crassulaceae, where there is substance and abundant water in the leaf—soft-leaved plants one may call them. Although limited in use the method is one which the gardener must not under-estimate. Apart from the fact that it is, when easy, an economical method, inasmuch as many plants may be obtained from one leaf, it would appear to offer a means in some cases of obtaining quickly flowering specimens. It has been shown that a leaf from near the flowering region in a *Begonia*, for example, if used as a cutting will give plants that flower earlier than can be obtained otherwise unless the whole flowering shoot be the cutting. A really adequate scientific explanation of this interesting phenomenon is a problem of propagation awaiting solution by further experimental work.

In leaf-propagation there is, however, a difficulty which has doubtless been in the way of its more frequent use. Root-formation takes place freely from the callus of the wound of the leaf as a rule. But the formation of the new shoot-bud may be retarded, for example, in *Ficus elastica*, *Camellia*, and *Hoya carnosa*. I have pointed out that in stem-cuttings which have the shoot-bud ready on the stem awaiting the vivifying impulse of a water-supply through new roots the

exuberant callus may be slow in forming roots or refuse to do so until the further application of the wound-stimulus by paring of the callus. Here in the leaf it is the new shoot-formation that is retarded. Why exactly this should be is another problem of propagation of which we await the solution. Stimulus of callus-paring operates in hastening if the callus be large, but that does not seem to meet the whole case. There is, indeed, evidence that the quality of food-material may be an influential factor, and that possibly an acid state of the plastic material may be a requisite for shoot-formation in the circumstances. If research should prove that quality of pabulum is an efficacious stimulus the importance of the discovery from the practical gardening standpoint would be great, and its bearings would extend beyond the immediate matter of propagation by leaf-cuttings.

From the standpoint of practical gardening the time at which a cutting is taken is a matter of considerable moment in many cases. In the outlook my thesis compels me to take, it bulks less largely because the colonial organization of the plant lends itself so readily to adjustment to artificial treatment and stimulus, that I might say, not only that all plants can be propagated by cuttings, but, also, with perhaps a large reservation, that most plants can be propagated at any period under right conditions—that is to say, conditions which secure that the turgescence and activity of the formative cells is adequately preserved while the stimulus to growth is applied. The risk in selection of a not favourable period is correlated with the condition of the food-supply, the conversion of which means, probably, delay in striking, with the attendant danger of wilting.

The environmental conditions necessary for striking cuttings are those which govern vegetative growth generally—air, heat, and water in adequate amount must be present in the soil and atmosphere—and they are determinant in difficult cases.

The use of sand, fibre, and like materials as a soil is a convention that makes for aeration of the sunk portion of the cutting, and if the relation is properly understood the evil resulting from plunging the cutting too deeply is explained—the cut ends of cuttings deep in the soil rot because of want of air. A canon of practice is—the sunk end should go no deeper than suffices to maintain the cutting steady in the soil.

The striking of cuttings in frames in the shade means conformity with the requirements of adequate temperature and moisture.

For many plants which strike readily no special preparations are necessary for securing rooted cuttings. Due attention to watering brings success. But there are difficult subjects for which the balance in respect of aeration, temperature, and moisture must be nicely adjusted, and for which in particular heat must be used as a stimulus.

At Edinburgh we have been so successful in striking every plant we have tried that a brief description of our methods may be of some value to practical gardeners. It is this success which begets denial of the statement of my text.

There are two outstanding lines of practice suitable with or without modification for individual plants and characterized by the manner in which water is supplied and the temperature maintained. They may be termed:

1. Under-root watering in shade.
2. Overhead watering in sunshine.

The method in which under-root watering is carried out will be understood by reference to fig. 168, which shows a section of one of our propagating pits. The essential feature is a teakwood tank on top of which is hinged a "light." Along the bottom of the tank runs a hot-water pipe $1\frac{1}{2}$ inch in diameter coming off the main heating pipes of the house and controlled by a valve outside the tank. A water layer covers the pipe in the tank. Over the water a sparred frame rests upon fillets fixed to the sides of the tank. Fillets at different heights allow of the frame being placed closer to or further from the surface of the water. Over the sparred frame crocks or slates are placed, and then sand or fibre, whatever be the soil medium that is used. The point of the whole is that the soil for cuttings overlies a chamber containing water from which the soil is separated by a layer of air. The water can be heated to a required degree by the water of the heating system circulating in the $1\frac{1}{2}$-inch pipe at bottom of the tank, and the moisture rising from the surface of the heated water ascends through the sparred frame and upwards through the overlying soil. In this way the soil is kept moist and any required temperature can be maintained by regulation of the valve. The water is replenished by a filling tube.

Cuttings in such conditions have their ends plunged in a moist aerated environment from which they get all the water they require. They are never watered overhead.

This method is particularly adapted to plants with hairy and woolly surfaces. It gets rid of the risk of surface decay that attends overhead watering in such plants. Our arrangements so far have only provided for striking cuttings in the shade, and the temperature maintained is derived from the hot-water pipes. By regulation of the valve the temperature can be varied—increased to give stimulus or kept uniform. I believe the temperature condition is of paramount importance.

The practice of striking cuttings by overhead watering in sunshine is, I believe, borrowed from the French. I learned it from that fine gardener, the Rev. Canon Ellacombe. The method is simply this—the cuttings are plunged in sand in an ordinary frame exposed to full sunshine and watered at short intervals, say every half-hour. The watering may be done automatically or by hand, but the latter involves frequent opening of the frame. The soil temperature may rise to an intense degree, but fluctuates. A uniform temperature is impossible. For some plants it is more efficient than that of under-root watering in shade. The cuttings strike more rapidly. It is not good for plants with woolly and hairy surfaces.

The increased rapidity with which some plants strike by this method leads to the conjecture that the direct rays of the sun have a stimulating influence other than that implied in the heat unit, and are more decisive in promoting energetic growth than the suffused heat derived by the cutting from the water alone. We have not yet made precise comparative experiments bearing on this point, but it has suggested the combining of under-root watering with full insolation. For this preparations are being made.

I may add one further remark to this account of our methods at Edinburgh in order to emphasize the value of the soil temperature. Our ordinary frames for cuttings are of brick and built against the side of a potting shed, and their base is only a few feet distant from one of the underground four-feet channels conveying leader heating pipes to our plant houses. Although these leader pipes are ensheathed in non-conducting material the temperature of the channel is steadily above that of the air outside, and I have no doubt it affects and contributes to the maintenance of uniformity of the temperature in the soil of the frame. This has probably its effect upon the cuttings, and in these frames many cuttings of difficult plants have been struck.

I have in this lecture confined myself to dealing with some of the matters that seem to touch the foundation of the idea expressed in my text and to an endeavour to show how some at least of the difficulties experienced by propagators are not a consequence of inherent qualities in the plants themselves, and that, therefore, by method in propagation they may be overcome. In what does that method consist?

(*a*) In maintaining adequate water-supply in the cutting until it is able to absorb for itself.

(*b*) In applying stimuli to encourage the development of the new water-absorbing organs, and to promote the development of the shoot.

(*c*) In securing adequate temperature and aeration at the rooting end of the cutting.

Therein is the essence of propagation by cuttings.

Much investigation will be required before we are able to prescribe for all desirable plants what is the best procedure for their vegetative propagation from the gardening standpoint. At Edinburgh investigation has been in progress for some years, and I have drawn largely upon the work of Mr. Laurence Baxter Stewart, the enthusiastic plant propagator, whom I am so fortunate as to have on my staff, as well as upon the work of one of my assistants—Miss Bertha Chandler—who has been engaged in preparing a story of principles and methods of propagation in which will be incorporated, with the results of her own experiments, a record of methods advocated by propagators as these are preserved in periodical literature and books on gardening. I hope that the record will be sufficiently advanced for publishing next year.

In conclusion, I wish again to express my appreciation of the honour of being invited to address you through these lectures in commemoration of the great horticulturist whose name they bear.

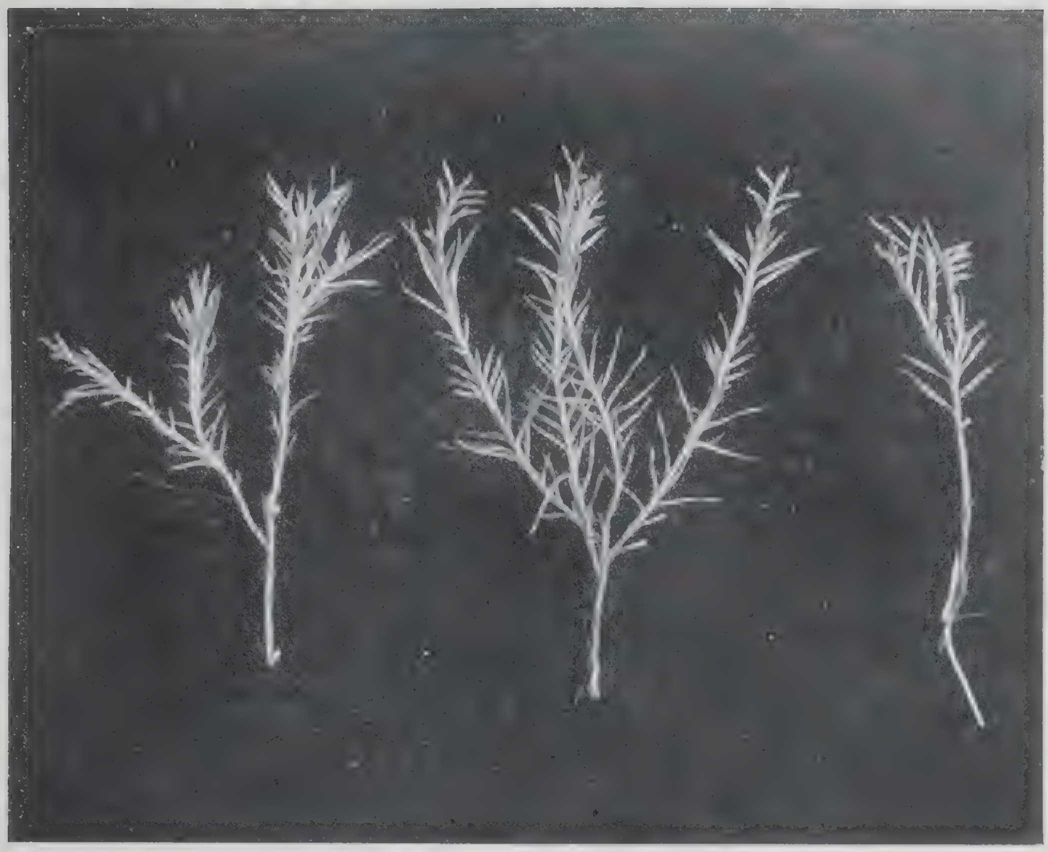


FIG. 166.—ACANTHOCARPUS PREISSII, *Lehm.*

Cuttings.

In middle: Before growth has begun.
On left: Basal bud enlarged.
On right: Basal bud now forming new shoot.

FIG. 167.—DRACAENA FRAGRANS, *Ker-Gawl.* VAR.

Rooted cutting with callus.

[*To face p.* 169.

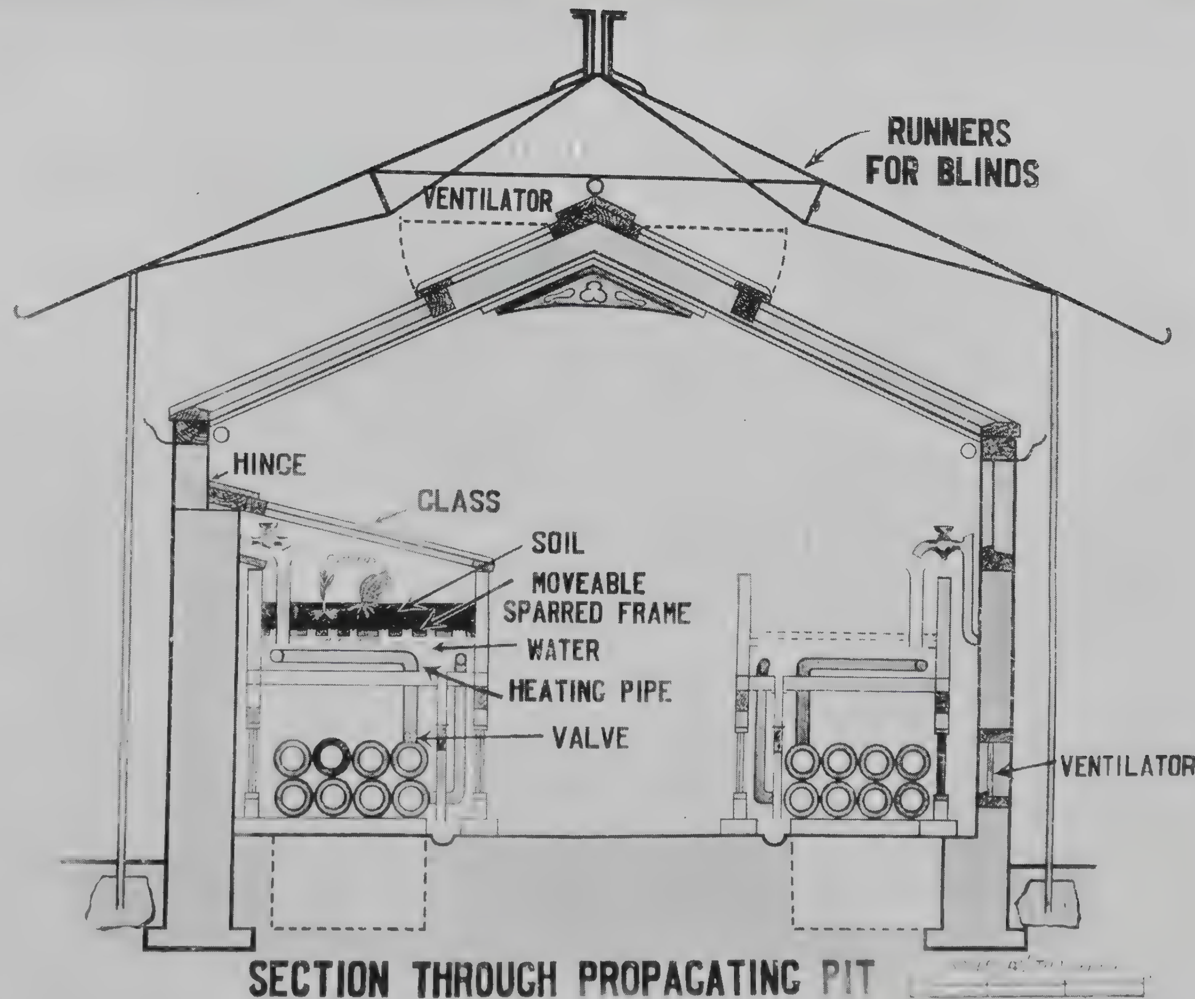

RUNNERS
FOR BLINDS
VENTILATOR
HINGE
CLASS
SOIL
MOVEABLE
SPARRED FRAME
WATER
HEATING PIPE
VALVE
VENTILATOR
SECTION THROUGH PROPAGATING PIT

Fig. 168

TOWN SMOKE AND PLANT GROWTH.

[Summary of Lecture delivered by CHARLES CROWTHER, M.A., Ph.D., October 8, 1912; Dr. A. B. RENDLE, M.A., F.R.S., in the Chair.]

THE past few years have witnessed a revival of public interest in the problem of the reduction of the pollution of the atmosphere by coal smoke, from which this country suffers perhaps more than any other.

At the International Conference on Smoke Abatement, which met in London last July, the problem was discussed in all its varied aspects, including that of the detriment to plant-growth, which is so obvious in our industrial towns.

The subject of the influence of smoke upon plant-growth is a wide one, and has received considerable investigation,* notably in connexion with the growth of trees in mining or other areas badly polluted with smoke. Within the limits of a short paper it is not possible to do more than touch upon some of the more important and interesting results that have been obtained, and it is proposed to deal here mainly with the investigations that have been carried out for several years and are still in progress in the Agricultural Department of the University of Leeds, and at the experimental farm connected therewith at Garforth.

NATURE OF SMOKE-POLLUTION.

The burning of coal as ordinarily carried out pollutes the atmosphere with two classes of impurities: the visible solid impurities or soot, and invisible gaseous impurities, the chief of which are carbonic acid gas (CO_2) and sulphurous acid gas (SO_2).

The production of soot is an indication of imperfect burning of the coal, since the material of which soot particles are mainly composed is carbonaceous and could be burnt under suitable conditions.

The production of gaseous impurities is inevitable, however, no matter how perfect may be the combustion of the coal, since the carbon and sulphur must come away mainly as gases.

Examination of soot reveals that it does not consist simply of unburnt particles of carbon, but there is always a certain amount of tarry matter and ash (or grit) present in it. This is well brought out in the following analyses by RUSTON.† The Table gives the composition of the soot obtained from the same coal burnt under different conditions:—

* For a summary of the principal investigations see HASELHOFF and LINDAU, "Beschädigung der Vegetation durch Rauch" (Leipzig, 1903). See also COHEN and RUSTON, "Smoke: a Study of Town Air" (1912).

† *Journal of Society of Chemical Industry*, xxx. (1911).

TABLE I.

—	Coal	Soot from same coal when burnt in			
		Sitting-room Grate.	Boiler Furnace		
			Sample taken at base of chimney	Sample taken 70 feet above base	Sample taken at top of chimney
	Per cent.	Per cent.	Per cent.	Per cent.	Per cent.
Carbon . .	69·30	40·50	16·66	21·80	27·00
Hydrogen .	4·89	4·37	0·86	1·44	1·68
Nitrogen .	1·39	4·09	0·00	1·18	1·21
Ash . .	8·48	18·16	75·04	66·04	61·80
Tar . .	1·64	25·91	0·09	0·80	1·66
Sulphur .	1·74	2·99	2·07	2·58	2·84
Chlorine .	0·27	5·19	0·11	1·46	1·60
Free Acid .	0·00	0·37	1·33	0·58	0·56

The analyses bring out very clearly the characteristic difference between domestic soot and boiler soot—long familiar in connexion with the use of soot as fertilizer—the boiler soot being far richer in ash and gritty matter, and poorer in the valuable fertilizing ingredient, nitrogen, than domestic soot. The figures for tar are of more immediate interest for our present purpose, however, since the proportion of tar in soot will largely determine the degree of permanency with which it will adhere to leaves or other surfaces upon which it falls. It will be observed that the domestic soot was far more tarry in character than the boiler soot, and further analyses given in the same paper indicate that the proportion of tar found in the former is by no means abnormal. In one case, indeed, soot removed from the top of a domestic chimney contained the extraordinary proportion of 40 per cent. of tarry matters.

Further reference to the Table shows that soots contain appreciable quantities of sulphur and chlorine, and that in most cases they have a decidedly acid reaction, due to the presence in them of free acid, probably sulphuric acid. The composition of soot thus suggests various possibilities of damage to plants upon whose leaves or other feeding area it may fall.

Degree of Pollution of Atmosphere in Different Parts of Leeds.

In order to obtain information as to the nature and distribution of the atmospheric impurities in and near Leeds, we collected samples of rain in ten different quarters of the city throughout the twelve months from November 1907 to October 1908, and determined the amounts of suspended and dissolved impurities present in them. The samples were collected by means of funnels 12 inches in diameter, which were left permanently exposed, so that the rain collected would contain all the impurities that fell and remained upon the funnel during the intervals between successive showers. The results have been published *in extenso* and discussed elsewhere.* The following Table gives a summary of them :—

* Crowther and Ruston, *Journal of Agricultural Science*, iv. 25.

TABLE II.—IMPURITIES IN LEEDS RAIN. (Pounds falling on each acre per annum.)

No.	Collecting Station	Nature of Locality	Total Suspended Matter	Tar	Sulphur	Chlorine	Nitrogen	Free Acid expressed as Sulphuric Acid
			lb.	lb.	lb.	lb.	lb.	lb.
1	Leeds Forge	Industrial	1886	110	169	164	17·7	35
2	Hunslet	,,	1565	69	215	198	18·4	90
3	Beeston Hill	Residential, near industrial	1163	149	336	101	18·4	30
4	Philosophical Hall	Commercial centre	849	78	197	75	16·9	45
5	Headingley	Residential	659	43	158	41	13·0	11
6	Armley	Residential, near industrial	593	34	156	108	14·1	29
7	Woodhouse Moor	,, ,, ,,	399	32	134	51	10·8	26
8	Kirkstall	Residential	352	28	147	57	10·2	8
9	Weetwood	Residential (outskirts of city)	147	26	98	34	11·5	11
10	Roundhay	,, ,, ,,	90	14	73	38	7·8	0

The results indicated a striking degree of pollution in all parts of the city, even the more remote residential suburbs receiving very appreciable quantities of air-borne impurities.

INFLUENCE OF ATMOSPHERIC IMPURITIES UPON PLANT GROWTH.

The attempt was next made to study more closely those aspects of smoke-pollution which might be expected to affect prejudicially the growth of plants.

Such a detrimental influence may be exercised in a variety of ways. Thus the *suspended insoluble* matters (visible smoke) may impede growth:

(*a*) By reducing the amount of light that reaches the leaves;

(*b*) By blocking up some of the stomatal openings of the leaves through which the carbonaceous food of the plant is taken up;

(*c*) By the poisonous influence of certain consituents of the suspended matters, *e.g.* sulphides. This influence may be exercised directly upon the plant or indirectly through the soil.

Some of the *soluble* impurities may also have a detrimental influence. This will certainly be the case with the lower sulphur compounds (sulphuretted hydrogen, &c.) and free acids.

INFLUENCE OF SMOKE UPON INTENSITY OF LIGHT.

Comparison of the records of sunshine recorders in the heart and on the northern outskirts of Leeds showed that in the city the duration of bright sunshine was curtailed by fully 17 per cent. But the sunshine recorder takes no account of light whose intensity falls below a certain arbitrarily chosen standard of brightness, but which is nevertheless of use to plants. We attempted, therefore, to compare the total daylight in different parts of Leeds by means of a more refined method of measurement. This consisted in exposing at six of the centres equal

amounts of an acidified solution of iodide of potassium. Light brings about a liberation of iodine in such solutions in quantities that are roughly proportional to the intensity of the light. The amounts of iodine liberated can then be determined by chemical methods.

The results are summarized in the following Table, which brings out clearly the connexion between smoke and curtailment of daylight.

TABLE III.

Station No.	Relative Intensity of Light (Clearest Station = 100)	Total Suspended Matters brought down on each acre per annum (see Table I.) lb.
2	61	1565
3	73	1163
4	80	849
5	83	659
7	94	399
9	100	147

If the results at the cleanest and dirtiest stations be compared, it will be seen that at the latter the intensity of the light was apparently reduced by no less than 40 per cent.!

But curtailment of light is only one of the retarding influences upon plant-growth that the smoke pall exerts. Innumerable tarry-soot particles fall upon the leaves of the plant and produce there a black deposit, which not only absorbs some of the already enfeebled light before it can penetrate into the leaf, but, according to our observations, will also choke up many of the stomata or breathing-pores which are so essential to the normal activity of the leaf. In order to demonstrate the reality of these effects the following experiments were made.

COMPARISON OF ASSIMILATORY POWERS OF LEAVES FROM DIFFERENT PARTS OF LEEDS.

Measurements were made of the amounts of carbonic acid gas that were assimilated by cherry-laurel leaves obtained from different parts of the city. In every case leaves of the current season's growth were taken * and compared with practically clean leaves from the neighbourhood of Station 9.†

The results may be summarized as follows, putting the assimilatory power of the clean leaves from Station 9 at 100.

TABLE IV.

	Relative Assimilatory Power
Station 5	= 53
,, 7	= 42
,, Midway between 1 and 7	= 15
,, 4	= 11½

The great reduction in assimilatory power in passing from the non-industrial district of Station 9 to the more polluted areas of Stations 1 and 4 is very striking. In the case of the dirtiest leaves, a mere

* The best leaves obtainable in the polluted areas were very much smaller than average leaves from the clean districts.

† For details of these and other experiments see CROWTHER and RUSTON, *loc. cit.*

cleansing of the surface with a dry cloth was found to nearly double their assimilatory power, although this still remained far below that of the leaves grown in the purer atmosphere of Station 9.

Having investigated in this way some of the effects of the solid impurities of smoke upon vegetation, attention was also directed to the soluble impurities, which may be brought down by rain or in particles of soot upon the leaves of plants, but which will mostly find their way to the soil. Of these the influence of free acid was selected for special investigation.

Influence of Acid Waters upon Growth of Grass.

For the purposes of the experiment a number of boxes, each one foot square, were filled with well-mixed soil from the same field and sown with timothy grass. The boxes were placed under glass to shield them from rain, and were watered periodically at rates corresponding to an annual rainfall of 25 inches, some with rain-water collected in Leeds (acidity usually 1-2 parts per 100,000), others with rain-water collected on the farm (situated in a rather polluted area), a third series with rain-water collected on the farm but with its free acidity neutralized before applying to the boxes, whilst six other series of boxes were watered with specially prepared waters containing respectively 1, 2, 4, 8, 16, and 32 parts of sulphuric acid per 100,000.

In the case of the Leeds rain, and of those waters containing the higher degrees of acidity, germination was distinctly checked, and the young shoots quickly acquired a yellowish tinge. The grass that received the strongest dose of acid (32 parts per 100,000) was killed off in little more than six months, and not a trace of vegetation of any kind was visible in the following spring. The watering with water containing 16 parts of acid per 100,000 proved fatal in little over a year, whilst the effects of the Leeds rain and of all waters containing more than 1 part of acid per 100,000 were very marked by the end of the third season. The weight and character of the grass grown in the three seasons is indicated in the following Table:—

Table V.

Description of Water Used	Total Dry Matter			Nitrogen in Dry Matter			Crude fibre in Dry Matter		
	1908	1909	1910	1908	1909	1910	1908	1909	1910
	grams	grams	grams	%	%	%	%	%	%
Garforth rain, neutralized .	28·0	24·9	14·7	2·47	2·22	1·58	24·3	21·9	23·7
,, ,, ordinary .	24·8	18·5	11·0	2·01	1·75	1·54	25·9	25·3	26·0
Leeds rain	23·8	17·5	6·6	1·96	1·42	1·23	26·4	26·3	27·2
1 part H_2SO_4 per 100,000 .	30·5	18·2	12·0	1·89	1·61	1·40	25·5	27·3	26·2
2 parts ,, ,, ,,	28·7	17·8	8·0	1·84	1·06	1·09	26·3	28·8	28·7
4 ,, ,, ,, ,,	28·8	10·0	3·9	1·74	0·95	0·86	27·4	28·9	28·9
8 ,, ,, ,, ,,	24·8	8·2	3·7	1·77	0·89	0·82	28·2	33·4	30·3
16 ,, ,, ,, ,,	23·8	1·8	nil	1·62	0·87	—	30·8	36·2	—
32 ,, ,, ,, ,,	14·1	nil	nil	0·93	—	—	31·6	—	—

It will be observed that on the whole in each season the yield was progressively less with increased acidity of the water used, and that by the third season the growth had been greatly enfeebled in all cases. The best results throughout were obtained with the neutral water. In the second season this stands out prominently above all the rest, the dividing line between moderate and poor growth by that time being between the "2 parts" and "4 parts." In the third season (1910) the differences were still more accentuated; the grass in two of the boxes was dead, in two other cases ("4 parts" and "8 parts") the yield was minimal; even the grass in the "2 parts" box was suffering severely, and, most interesting of all, the Leeds rain was now definitely telling its tale—falling behind even the "2 parts" box.

The composition of the grass from the different boxes shows also characteristic variations. It will be seen that with increased application of acid there is a general tendency for the grass to become poorer in nitrogenous matter and richer in crude fibre. This is a matter of much significance to the agriculturist, since it implies a marked reduction in the feeding value of the grass, and if it is borne out upon actual meadow and pasture areas, is of considerable economic importance.

At the end of the third season the soils in the boxes were sampled and submitted to chemical and bacteriological analysis.

The chemical analysis showed that the acid waters had brought into solution appreciable quantities of the phosphates and potash of the soil, and that also more ammonia was present in the soils that had received the stronger doses of acid than in those that had received purer waters. The relations were quite different, however, with regard to the proportions of carbonate of lime left in the soil. The stock of this essential ingredient had been almost exhausted by the more acid waters. Further measurements of the powers of the soils to absorb oxygen (a guide to fertility) showed that this had been greatly decreased by the acid watering.

The results of the bacteriological analysis were very illuminating.

TABLE VI.—BACTERIOLOGICAL INVESTIGATION OF SOILS.

—	Total number of bacteria per gram of dry soil	Ammonia produced (from Peptone) in 3 days	Ammonia converted into Nitrates in 21 days	Nitrogen fixed (per gram of Mannite) in 13 days
	thousands	milligrams	milligrams	milligrams
Garforth rain, neutralized .	5228	13·9	1·02	4·6
" " ordinary .	1690	12·7	0·84	3·7
Leeds rain	1170	11·7	0·73	3·0
1 part H_2SO_4 per 100,000 .	1260	12·1	0·80	3·3
2 parts " " "	1100	11·2	0·85	3·0
4 " " " "	690	10·5	0·52	2·8
8 " " " "	130	10·3	0·36	2·4
16 " " " "	40	10·3	0·28	1·9
32 " " " "	15	8·1	0·13	1·8

It will be seen that the influence of the treatment with acid upon the extent and character of the bacterial flora of the soil was very

striking, the total numbers of bacteria diminishing rapidly with increased acidity, this being reflected also in diminished activity as regards ammonia-production, nitrogen-fixation, and, above all, production of nitrates in the soil.

Knowledge gained in recent years regarding the functions of soil organisms in connexion with plant growth enables us to assert confidently that this reduction of bacterial activity is the main cause of the reduction of growth of the grass brought about by the acid waters.

Further Experiments in Progress.

Our experiments have thus demonstrated clearly that the plant growing in a smoke-polluted area is afflicted both at its leaves and at its roots. What this may mean in actual plant growth is being tested by an experiment, not yet completed, in which plants of the same kind, variety, and age are being grown simultaneously in five different parts of Leeds in soil taken from the same place. At each centre three boxes of this soil have been placed, and a succession of crops is being grown therein.

The first crop taken was radishes. These were followed by lettuce and then by winter cabbage. The cabbages were planted about the end of September, but did not do well at any centre. There were, however, very significant differences. At the centre most badly polluted by smoke all the plants were dead before Christmas. At the cleaner centres most of the plants survived until severe frost was met with in February. This proved fatal to nearly every plant except at the centre where smoke-pollution was lowest. Here, out of the nine plants started with, eight survived the winter. At the next cleanest centre two plants survived, but in all other cases not a single one.

In the spring of 1912 fresh cabbage plants were introduced, grown throughout the summer, then cut and weighed. Up to the present we have thus obtained in this experiment three crops, the results being as follows:—

Table VII.

Station * (see Table II.)	Total suspended matters brought down by rain on an acre per annum (Table II.)	Weight of crops obtained		
		Radishes	Lettuce	Cabbage
	lbs.	grams	grams	grams
2	1565	226	44	505
4	849	242	56	1250
7	399	297	104	3056
7–9	273	449	120	4167
9	147	496	140	3425

* The centres at which these vegetation tests are being carried out are, with one exception, in close proximity to the stations at which the rain samples were collected. The exception is the centre marked 7-9, which is roughly midway between Stations 7 and 9 of Table II. The total suspended matters are given as the mean of those given in Table II. for these two stations.

It will be seen that even with the first crop there was a very marked correlation between atmospheric pollution and the weight of crop obtained, and, further, that the differences have become more pronounced with each successive crop. The experiment is still in progress, so that we must reserve detailed discussion of the results, but the data given above may serve to show that we are obtaining proof that the detrimental effects demonstrated in our earlier laboratory experiments do actually exercise a measurable influence upon the growth of plants under practical conditions in the open.

We are also investigating further effects of atmospheric pollution upon plant growth, in particular the effects upon the composition and duration of growth of plants, but our observations on these points are not yet ripe for discussion.

During the past eighteen months the distribution of smoke-pollution over an extensive area on all sides of Leeds has been studied, and the results which will shortly be published indicate that a very wide area of the surrounding country receives marked smoke-pollution from the city. The detection and measurement of effects upon the crops in these areas is a matter of great difficulty, since the contrasts are by no means so marked as within the city, but we are hopeful that eventually we shall be able to demonstrate that the farmer and horticulturist in the neighbourhood of the smoky town have a substantial grievance against the smoke distributors.

DOUBLE FLOWERS.

By Miss E. R. Saunders, F.L.S., F.R.H.S.

[Read November 5, 1912; Mr. W. Bateson, F.R.S., in the Chair.]

The subject of "double" flowers is one of considerable interest to all who, whether from the æsthetic or the commercial point of view, are at pains to consider decorative effect in the garden; while to the purely scientific botanist, whether morphologist, physiologist, or breeder, the subject presents problems which are still largely unsolved.

The morphologist is concerned with the nature of the modification which the flower has undergone in the process of becoming double; the physiologist with the causes which call forth this structural change; and the breeder, more especially, with the relation of the double character to the normal—of the sport to the type—in other words, with the question of inheritance.

As regards the precise physiological causes which lead to the formation of double flowers we still have little exact knowledge. Gardeners in the past have held views as varied as they are often fantastic, and even contradictory, as to the methods to be employed for obtaining or increasing the yield of doubles. Thus, *e.g.* in the case of Stocks the German growers advocate a method of starvation, growing the plants in pots and giving them only sufficient water to keep them alive; on the other hand, a French grower—Chaté—in whose family the cultivation of Stocks had been carried on for more than fifty years, upheld the practice of removing the weaker branches from the plant, and many of the pods from the stronger ones, in order that all the sap might be employed in nourishing those that were left. Some of these traditions still linger, but for the most part they have no more than an historic interest. So far as I am aware there is no known instance in which we can at will, by any specified method, induce the production of doubles in plants which, when not thus treated, exhibit no tendency to double, and upon this part of the subject I have here nothing further to add.

As to the morphological causes of doubling, we have the very full account by Professor Goebel of his investigations on this difficult point published in 1886.* By microscopic examination of the earliest stages in the development of the flower he was able to determine the precise nature of the doubling in a large number of genera, and the views here expressed as to the nature of the doubling in the types considered are mainly taken from his account.

It is, however, more especially in regard to the third aspect of the subject, viz. the consideration of doubling from the hereditary stand-

* See "Beiträge zur Kenntniss gefüllter Blüthen" in *Pringsheim's Jahrbuch*, Bd. 17, 1886.

point, that our knowledge has in recent years advanced, and it is with this side of the subject that I shall mainly deal in the following pages.

To give a precise definition of what is meant by a double flower is by no means easy, for the term is commonly applied to flowers showing very various structural abnormalities. Almost all double flowers, however, have this one feature in common, that the number of petal-like structures present is in excess of the normal. This increase in the number of "petals" may be brought about in several ways. The late Dr. MASTERS, in his work on Vegetable Teratology, groups the various causes leading to the condition popularly termed double under the following heads:

(1) Petalody = petaloid modification of structures ordinarily present in the flower, but not normally resembling petals. In this case the number of members is not increased. (See fig. 169.)
(2) Augmentation in the number of petals as a result of augmentation in the total number of structures present. (See fig. 170, D.)
(3) Isolation of organs ordinarily united.
(4) Prolification (proliferation) = the formation of buds within the flower. (See fig. 175.)
(5) Dissection of the petals, and the formation of outgrowths.

Of these the two first-named are by far the most frequently met with, and we may confine our attention for the moment to examples of these two classes. In the first case—that of simple petalody, we are concerned with the development of petal-like structures in place of (in most cases) either stamens or pistil or both. In cases belonging to the second class the increase in number of the petals may be *real*, due to actual multiplication of the number of whorls, or only *apparent*, the augmentation resulting from the splitting in various ways of the original primitive rudiments which are present in their normal number.

Though in the abstract we may thus conveniently distinguish the morphological causes producing doubleness we find that in practice it is not always easy to ascertain with which we are dealing, for the true nature of the cause can often be determined only by investigation at an extremely early stage in development. The difficulty becomes greater still in cases, not uncommon, where a species produces doubles of more than one type, and again in the numerous instances where two distinct processes are in operation in the flower at the same time, as, *e.g.*, where petalody is combined with a greater or lesser amount of splitting.

A combination of petalody with some amount of splitting seems in fact to occur much more frequently than either simple petalody or than mere increase in the number of parts.

As an instance of simple petalody we may take the case of the Columbine (*Aquilegia*) (fig. 169). The fact that the flower of *Aquilegia*,

unlike most of the Ranunculaceae, is cyclic throughout, renders it easy to see in what way the doubling is brought about. This genus is, moreover, interesting in that we not only meet with the double form of the type, but also with the double of the *stellata* variety, in which the petals are flat without spurs. In the single the flower is composed of a succession of many alternating whorls of five members each, so that altogether they form an arrangement of ten radial rows. The calyx, corolla, and pistil each contribute one whorl, the remainder being composed of the numerous stamens. In a high-grade double normal stamens are few or absent, and in their place we find an equivalent number of structures resembling the petals in colour and shape and arranged, like the stamens in the single, with perfect regularity in alternating whorls. The fact that there is no disturbance in the regular alteration of the whorls shows that these additional petals merely represent an equivalent number of stamens which have undergone petaloid transformation. We have here, in fact, a good example of simple petalody affecting the male reproductive organs. As a result little or no pollen can be got from such doubles, but the pistil functions as usual. In the type form the spurs of all the petaloid structures borne on the same radial row are inserted one within the other, forming as it were a continuous kind of hose-in-hose arrangement, in consequence of which the whole row is generally shed together as one mass. (See fig. 169, E.)

Besides the ordinary branching, tall form, a peculiar dwarf strain is sometimes met with in which the very small and compact flower stands erect or nearly so, instead of drooping as in the normal case. Though of interest to the botanist on account of the association of a particular habit with certain floral characteristics this form will scarcely find favour with the florist.

Though breeding experiments show that individuals exhibiting either the double character or the *stellata* form can breed true it is evident that neither in the case of doubling nor of absence of spurs is the relation of the variation to the normal a simple one. For flowers are found of every grade between the normal single at one end of the series and the full double at the other, and similarly between the flower with all the petals spurred and the flower with none. Not only so, but flowers of very different grades may be borne on one individual at one and the same time. In the case of the spurred character, moreover, even the *flower* may be mixed, some of the petals being spurred and some flat. There does not appear to be any obvious arrangement on the plant either of the more and less double, or of the more and less spurred flowers, and the nature and behaviour of these mixed individuals needs further investigation. No doubt crossing has gone on repeatedly between the single spurred type and both varietal forms in our gardens, for both have long been known to horticulturists.* But if the mixed character frequently observable is to be attributed wholly to repeated inter-crossing the conditions of inheritance here must

* Both are figured and described by L'OBEL (Kruydtboeck, 1581).

evidently be somewhat different from those obtaining in the ordinary case of simple Mendelian inheritance, and for the present a statement of the facts is all that is possible.

The second class of double mentioned above, in which doubling is due to an actual multiplication of whorls, is well seen in *Lobelia* (fig. 170). Here we have a less commonly occurring condition, viz., doubling in a flower with irregular (isobilateral) symmetry. In the single flower there are four whorls altogether, one each of calyx, corolla, stamens, and pistil, the corolla being bilabiate. In the double-flowered individuals the number of perianth whorls may be greatly increased, *e.g.* in a good specimen of the strain 'Kathleen Mallard' six or more extra whorls of corolla may be seen. Some plants, on the other hand, only develop one additional whorl, while others again exhibit intermediate grades. But though the number of whorls thus varies considerably in different plants, it is usually constant for the individual. The members of each whorl regularly alternate with those of the next, though in very double specimens the innermost ones are sometimes incomplete, the suppression of some members in these cases possibly being a mechanical necessity due to lack of space.* Here again, as in the Columbine, the regular alternate arrangement of the several whorls, and the fact that one sees repeated in turn in the inner whorls the symmetry and colour pattern of the outer ones points to true multiplication as the cause of the augmentation in number. When only one extra whorl is present either as calyx or corolla (making three altogether) the reproductive organs remain normal and produce good ovules and pollen (fig. 2, B and E). This is occasionally found to be the case also when the number of perianth whorls is increased to four, but more often the stamens then become completely transformed so that the ovary alone remains functional (fig. 2, C and F). When a larger number of whorls occur both stamens and carpels are converted into petaloid structures, and neither ovules nor pollen are produced. Such plants being completely sterile can only be propagated by vegetative methods, whereas the lower grades can be bred from, like the singles (fig. 170, D and G).

We may now consider some examples of the more frequently occurring types of double where, instead of true multiplication, we find splitting in varying degree either in the petals or more commonly in the stamens which have become petaloid. In such cases a regular arrangement of these supernumerary structures is not usually discernible, though some exceptions occur, as *e.g.* in the Chinese Primrose (*Primula sinensis*), where these additional structures are few in number. The ordinary type of double of the present day shows within the corolla proper a second row of petaloid structures standing opposite to those of the outer row and having their surfaces reversed, the more brightly coloured facing towards the outside, the paler towards the inside of the flower. Following upon these are the five

* According to GOEBEL these last irregularly arranged members probably represent modified carpels (*loc. cit.* p. 254).

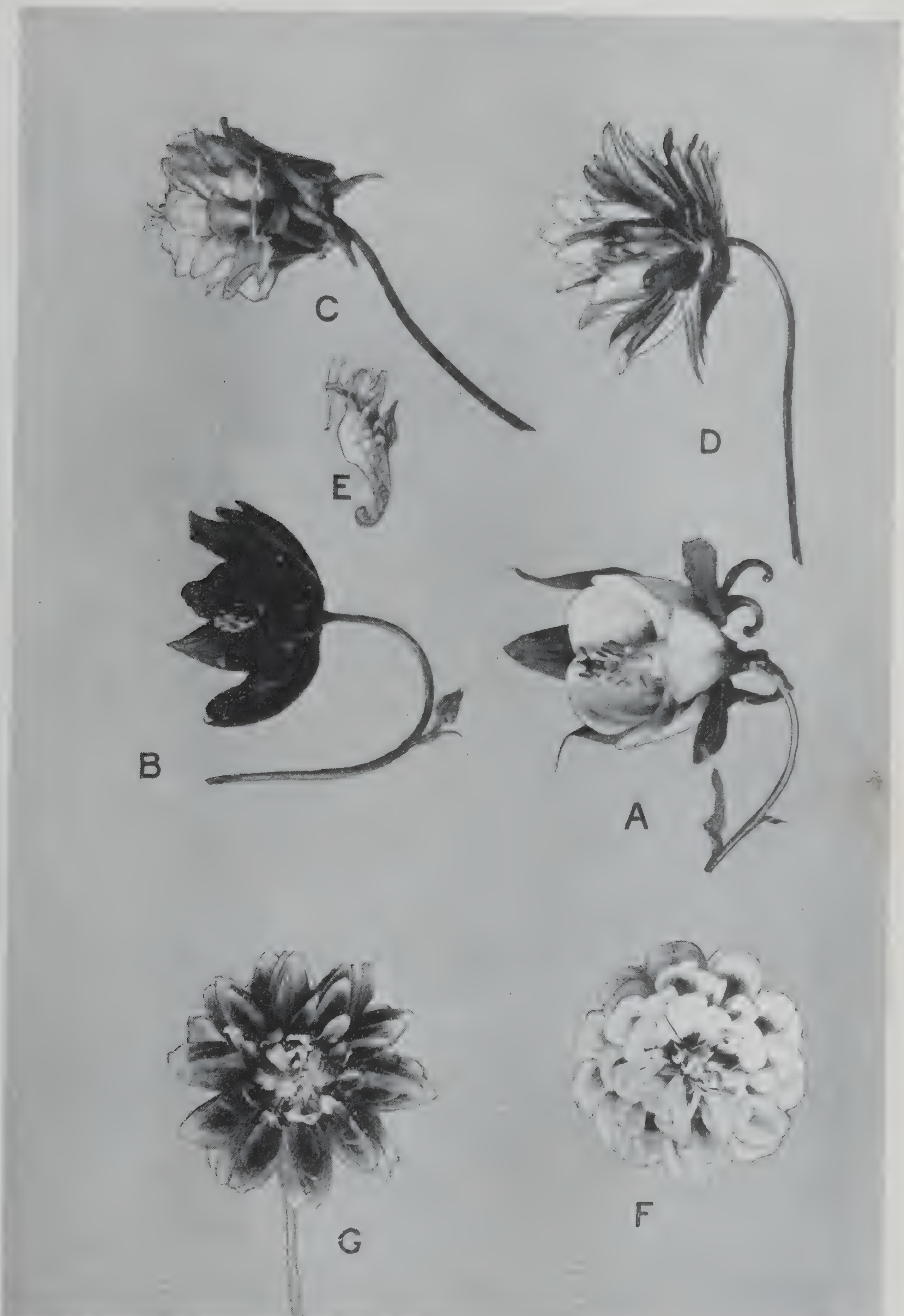


Fig. 169.—Aquilegia.

(A) Single and (C) double flowers of the type form, and (B) (D) of the spurless variety 'stellata.' F, G, double flowers of the same types in surface view. E, a radial row of petals showing the hose-in-hose arrangement.

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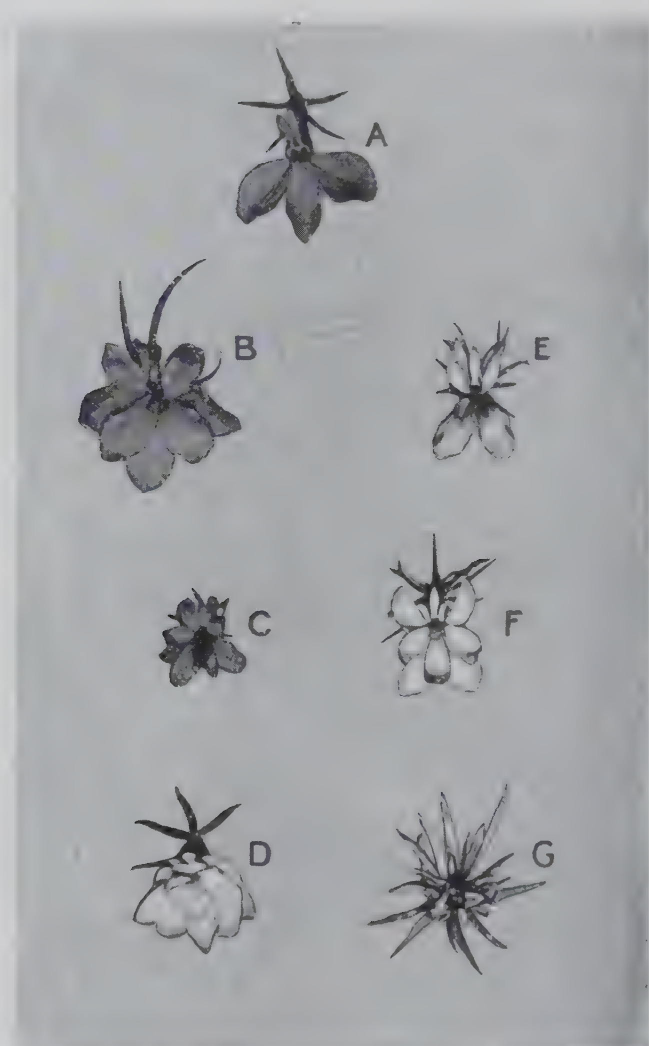

FIG. 170.—LOBELIA ERINUS SHOWING SINGLE FLOWERS AND VARIOUS GRADES OF DOUBLES.

A, single. B, calyx single, corolla double. C, calyx single, corolla treble. D, calyx single, corolla multiple. E, calyx double, corolla single. F, calyx double corolla double. G, calyx multiplex, corolla absent.

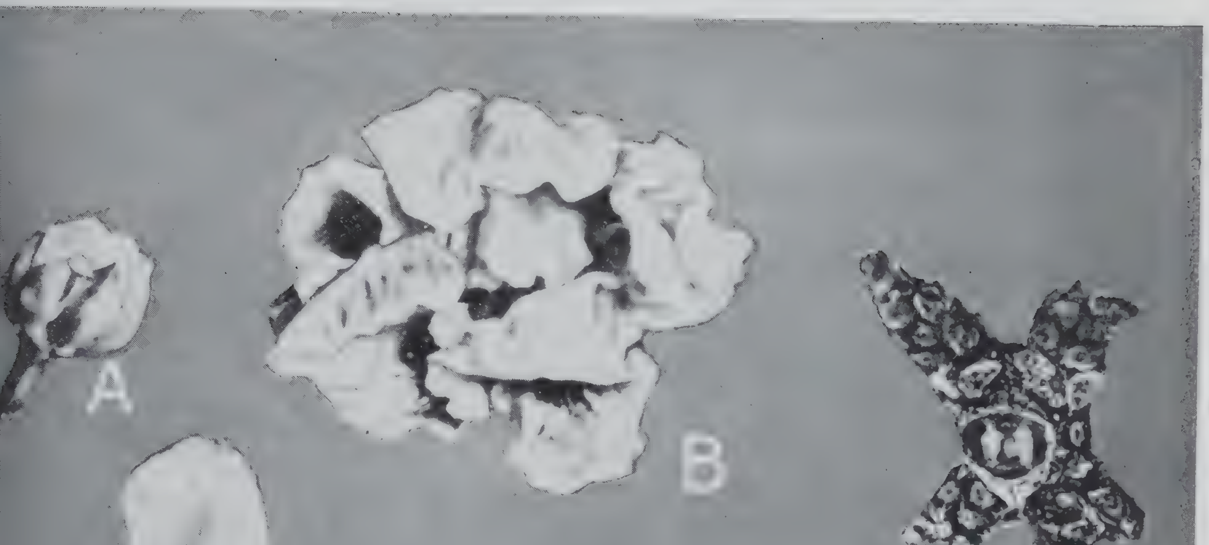

FIG. 171.—WALLFLOWER (*Cheiranthus Cheiri*).

A, Bud; B, flower; and D, naked axis of modern type of double, capable of propagation by seed. C, One of the petals showing the first stage of splitting. E, Bud; F, flower; and G, naked axis of single for comparison. The axis of the double form (D) shows the scars of the numerous petals which arise by splitting of the four primitive rudiments in four groups at the four projecting angles.

Fig. 172.—Two types of double flowers in Sweet William (*Dianthus barbatu*

One due to simple petalody of the stamens giving 15 petals; the other with many more petals, since petalody is accompanied by splitting.

Fig. 173.—Three grades of doubles in Hollyhock (*Althaea rosea*).

To face p. 473.

stamens in the characteristic position, also opposite to the petals proper. The view commonly held is that the additional petaloid structures are produced by tangential splitting of the stamens, but the cause of the curious reversal of the surfaces needs some further explanation. Formerly a more fully double type was in general cultivation, in which a third set of petaloid structures fill the centre of the flower, and only these central segments have the surfaces reversed. We have another instance in the Wallflower (*Cheiranthus Cheiri*) of a plant in which two distinct types of double occur, viz. the old-fashioned English form only capable of propagation by vegetative methods, in which a mass of petaloid structures occupy the whole centre of the flower, stamens and carpels being both absent: and the more recent double strains of the German growers in which the flower is not so fully double (fig. 171, E). In these latter plants stamens and carpels are usually normal and the doubling results apparently from the splitting of the petals, which give rise to a larger or smaller number of additional petaloid structures borne on the four projecting angles formed by the enlarged top of the axis (fig. 171, D).

But the aspect of the morphological question of greatest interest to the breeder is the practical one—To what extent does the condition of doubleness involve a condition of sterility? As we have seen, the doubling may be of such a nature as to bring about complete loss of function of *both* reproductive organs. We have the case already mentioned of the old-fashioned double Wallflower; to the same class belong the doubles of *Arabis albida, Cardamine pratensis, Abutilon* (of more recent introduction), Stocks (*Matthiola*) (fig. 175), and many others. On the other hand, the doubling may be such as to affect the organs of *one* sex only, while those of the other remain functional. We have a good example of a case in which it is the female organ which becomes sterile in the double, while the male organs still function in the *Petunia*, which produces more than the normal number of stamens and an abundance of good pollen, but has the ovary so malformed as, in almost all cases, to be incapable of being fertilized (see fig. 174). Among some highly cultivated strains double individuals are occasionally found from which some seed can be obtained, but these cases appear to be extremely rare; moreover, this capacity to yield seed may not hold good for all the flowers on such individuals, nor, apparently, for all their offspring. Except in these rare cases, therefore, it is only possible to breed from the singles. Moreover, since the anthers of the doubles are generally deeply buried among the compact mass of supernumerary petals, the propagation of doubles can practically only be ensured by fertilizing singles by hand, with the pollen of doubles, and seed supplied commercially is obtained in this way.

The converse case where the male organs become sterile while the female are practically unaffected is exhibited by the Sweet William (*Dianthus barbatus*), where we find double flowers almost always destitute of pollen, but with a functional ovary (fig. 172). This is not

infrequently the case also with the Carnation (*Dianthus Caryophyllus*), though less constantly so than in the Sweet William. But though fertile anthers occur more frequently in *D. Caryophyllus*, the supply of pollen is nevertheless often so scanty that the pure breeding of Carnation doubles on a large scale is a troublesome matter.

By far the largest class of double-flowered plants, however, includes those in which both reproductive organs remain capable of functioning, even despite a considerable degree of doubling, as, *e.g.*, in the Hollyhock (*Althaea*). Some double-flowered plants, however, cannot be rigidly classified on this basis, owing to the fact that considerable grading occurs among the different flowers on one individual. This occurs to some extent in the Hollyhock itself (fig. 173), but here even in the most fully double flowers both pollen and ovules appear always to be present. The difficulty sometimes in this case is to draw the line between a true single and the individual in which the first stages of doubling are evident in some of the flowers but not in all, and may therefore easily be overlooked. A more striking case is that of the Welsh Poppy (*Meconopsis cambrica*), where the flowers on some individuals, although all of the fully double type, may vary to the extent that some will show a few functional stamens but have no ovary, others may have an ovary capable of yielding a small quantity of seed but be destitute of pollen, while others again lack both reproductive organs. Classification according to sterility or otherwise of the sexual organs is here not practicable.

To sum up the various morphological points that have been touched upon we find:

(1) That the double condition is due to several distinct morphological causes.
(2) That different strains of the same species may exhibit quite distinct types of doubleness.
(3) That in some species almost every intermediate grade may be found between the single and the extremely double type, and further that in some cases even the different flowers on one individual may show distinct grading.

When we come to investigate the *inheritance* of doubleness we find in the same way considerable variability in the genetic relationship of double to single. In some forms singleness is found to be dominant and doubleness recessive, and in others the reverse is the case. Thus, for example, in the Welsh Poppy (*Meconopsis cambrica*) and the Carnation (*Dianthus Caryophyllus*) the single condition is recessive to the double; in other words, when pure-breeding doubles and singles are intercrossed the resulting crossbreds are more or less double. In both cases doubling results from a petaloid metamorphosis of the stamens, either alone or combined with a somewhat irregular splitting of these structures. There is some evidence that the same relation of dominant to recessive between double and single also holds good in the case of Lobelia. On the other hand, when similar matings are

made in the case of the Chinese Primrose (*Primula sinensis*) and the Wallflower (*Cheiranthus Cheiri*) the first crossbred generation consists of singles.*

Though we can learn something of the relation of double to single by observation of the crossbreds obtained by mating the two forms together, it is only by the statistical examination of the later generations derived from these first crossbreds that we are able fully to understand the conditions underlying the appearance of doubles in each case. Breeding investigations of this kind show beyond all doubt that doubling is a character which in many cases is transmitted from parent to offspring in accordance with definite principles, or laws of heredity, and that these principles are inherent in the nature of the organism itself and are independent of external conditions. As showing the nature of the evidence upon which this statement is based I may briefly state the facts in the case of certain types which have been studied in some detail.

If the single plants produced by crossing a single with the present-day type of double in *Primula sinensis* are self- or inter-bred they are found to yield in the next generation a mixture consisting on the average of three single plants to one double.† The doubles so obtained, and their posterity, breed true to doubleness. A certain proportion of their single sisters will be found to be incapable of throwing doubles, but on the average two of every three of these singles will be capable of yielding either 25 or 50 per cent. of doubles according as the pollination is made with the pollen of a single or a double, and such doubles also breed true. In fact, a double once obtained, however bred, henceforth breeds true, if protected from the pollen of singles. The behaviour of the single plants, on the other hand, cannot be predicted from inspection. Their behaviour varies according to the way in which they have been bred, although in outward appearance they are all similar. Only by observing the offspring can we discover whether a given single is pure-bred or crossbred in constitution, for, if pure-bred it will yield only singles, if crossbred, it will give a definite percentage of doubles (25 per cent. if self-fertilized, 50 per cent. if crossed with a double). In the double of the Primula we have an illustration of a very simple case of Mendelian inheritance, the essential feature of which is that in the case of two opposite characteristics, one due to the presence and the other to the absence of a certain factor or combination of factors, the reproductive cells, likewise, either carry or lack each of the factors concerned. Hence when, as here, a particular characteristic appears to be determined by one factor only, a plant may be derived from any one of the following combinations:

* Exceptionally, however, an F_1 crossbred in the Wallflower may show an extra structure in a flower here and there in the form of a slender filament behind the petal, due to splitting (fig. 171, G).

† See Gregory, "Experiments with *Primula sinensis*," *Journal of Genetics*, vol. i. No. 2.

from two germs both carrying the factor, or
from two both lacking the factor, or
from one carrying the factor and one lacking it.

When the individual is derived from two similar germs, it exhibits and breeds true to the character which those germs carry, whether it is the dominant (here singleness) or the recessive (here doubleness).

If the individual is derived from one germ which carries, and one which lacks, the factor in question, it exhibits the character represented by that factor (in this case singleness), but it shows its mixed constitution in the mixture of the offspring.

The case of the Wallflower is not quite so simple. In this case the splitting (which here occurs in the petals) may be carried so far as to result in a large number of structures all completely separate. Among the mixed offspring obtained from crossbred singles (singleness being dominant) occur doubles of all grades from the very fully to the very slightly double. The doubles yield only doubles, but to what extent each particular grade breeds true needs further investigation.

The Welsh Poppy (*Meconopsis*) affords a converse case to the Wallflower. Singleness is here recessive, and the singles, whatever their parentage, breed true. The doubling, as previously stated, results from petalody of some or all of the stamens, accompanied in the highest grades by petalody of the ovary. The fact that considerable grading occurs even among the flowers of one individual introduces a difficulty in classifying these plants and in determining the inheritance of the different grades.

In the Carnation and Sweet William we probably have two more examples where singleness is recessive to doubleness.

A particularly interesting case is that of Petunia. Here, according to the evidence up to the present, all singles, if self- or inter-bred, yield only singles, but if fertilized with the pollen of doubles, they give a mixed offspring consisting of singles and doubles in the first generation.* Analogy with what we now know to be the case in Stocks (to be described presently) points to the conclusion that here, as in *Matthiola*, we have the peculiar condition in which the distribution of certain factors is not the same for the male and the female germs of the individual.†

If we suppose that all the pollen grains of the single carry some factor (or factors) essential to the manifestation of singleness, and that *either* the ovules of these same singles are mixed and the pollen grains of the double are all alike and all carry doubleness, *or* conversely that the pollen of the double is mixed and the ovules of the single all carry doubleness, we can account for the results obtained. The fact that up to the present all the singles crossed with the pollen of doubles have yielded some doubles is in favour of the latter alternative.

* See "Studies in the Inheritance of Doubleness in Flowers. I.: Petunia," *Journ. of Genetics*, vol. i. No. 1, 1910.

† See *Report IV. to the Evolution Committee, Royal Society*, p. 40, 1908, and *Journ. of Genetics*, vol. i. No. 4, 1911.

Definite proof of the correctness or otherwise of this view will be forthcoming when we know the results of the reciprocal cross double ♀ × single ♂, evidence which has hitherto not been available owing to the difficulty of procuring seed-bearing doubles, but which I now hope in a short time to obtain. The exact proportion of doubles obtainable from the singles is also not yet certainly established, though there is some amount of evidence pointing to a proportion approximating in some cases to three single to one double, in others to nine singles to seven doubles, the doubles appearing in every case to be in the minority.

It is in Stocks, however, that we meet with the greatest complexity as regards the inter-relationship of the factors concerned in doubling. Here the doubles, which contain an enormously increased number of petaloid structures, are so double as to be completely sterile, neither pollen nor ovules being present. In other genera where this is the case the only means of propagation is by vegetative methods. But the case of the Stock appears to be unique, in that the doubles are obtained from the seed of pure-bred singles. The single and double forms are sharply separated; there is no series of intermediate grades to bridge the gulf between them. It is true that an individual may occasionally be found on which, among the many flowers borne in a season, one here and there may show one or even two extra petals, but it is open to question whether this condition is connected with true doubling. It does not, at all events, appear to have any hereditary significance. For the seeds obtained from such flowers give the same results as those from the normal flowers on the same individual. If the individual has been bred from a double-throwing strain, then seeds from either normal flowers or flowers with an extra petal will produce some doubles. If, on the other hand, the individual belongs to a strain producing only singles, then the seeds of all the flowers, whether normal or not, produce only singles.

My attention was first seriously directed to the investigation of the inheritance of doubling in Stocks when, after breeding these plants for several years for the purpose of determining the inheritance of hoariness and flower colour, and always obtaining numerous doubles, I found one season, to my surprise, that among the whole crop there was not a solitary double to be found. But, if on the same ground, and under what appeared to be similar conditions, sowings in some years yielded numerous doubles and in others none, it seemed unlikely that conditions of nutrition or environment, as commonly held, should be the determining factor.* The sudden total absence of doubles convinced me that current tradition concerning the appearance of doubles in Stocks would prove to be without foundation, and that doubling, like the other characters previously investigated (see above), would be found to be inherited in accordance with definite laws, which breeding experiments, either by the pure-line method of culture

* Later it became clear that this result was due to the fact that the families raised in this year happened all to be derived from those matings in which non-double-throwing individuals had been used.

or by crossing, must reveal. That such is in fact the case I think we may now regard as fully established. The case is, moreover, one of special interest, for we have to deal here with a character which cannot be transmitted by those individuals which exhibit it, for such individuals are completely sterile. No double can leave posterity, and yet some strains produce more doubles than singles in every generation. The singles of these strains are indistinguishable to the eye from other singles which have not this power, and these double-throwing singles, moreover, produce the doubles in definite ascertainable proportions which are constant for individuals of the same constitution. These various facts we are now in a position to explain.

If we start with an individual or a strain of Stocks which is found to give exclusively single offspring, we may now confidently expect that *all* successive generations derived from these offspring will consist entirely of singles, provided that the plants are allowed only either to interbreed among themselves or to be crossed with other strains which similarly yield offspring all single. And this result follows whether the plants are supplied with much water or with little, whether they are grown in a rich soil or a poor one. We can account for this uniform result in each successive generation of the descendants on the supposition that the individual with which we started contained certain factors, the presence of which causes the flowers to be single; and further that these factors causing singleness were brought in from both sides of the pedigree—that is to say, that they were borne by *both* the contributing germ cells (by the egg cell in the ovule and by the male element in the pollen tube), so that the resulting individual was homozygous in respect of these factors. An individual will contain the factors in respect of which it is homozygous in all its germ cells; consequently an individual thus constituted in regard to the factors for singleness will produce offspring all single, and these offspring will in turn produce successive generations of singles.

The singles of the other class—of the double-throwing strains—also give constant and uniform results. If we take an individual belonging to one of these strains and self-fertilize it we obtain a mixed offspring of singles and doubles, the doubles being in excess. If these single offspring are again self-fertilized or inter-bred they again yield a mixture in the same proportions as before, and this result obtains in all the succeeding generations. The individuals of these strains, with, so far as we know, but one exception (see p. 481), breed true in respect of all other characters which have been investigated, such as colour of the cell-sap in the petals—whether various shades of red or purple, or colourless; colour of the plastid bodies—whether cream or uncoloured; colour of seed—whether of some shade of brown or green; character of the leaf and stem surface—whether fully hoary, half hoary, or destitute of hairs as in the wall-flower-leaved forms: but in regard to singleness they are constitutionally incapable of breeding true; they have the habit known as "ever-sporting." The explana-

tion of the behaviour of these ever-sporting forms becomes clear if they are tested by crossing with non-double-throwing singles. If in such matings the true-breeding single is used as the female, and the double-throwing single as the male parent, the resulting cross-breds are *all* found to give a proportion of doubles—amounting in the typical case to an average of one in four; *all*, therefore, must have inherited from their double-throwing father the particular constitution which enables an individual to throw double offspring. As explained above, we have reason to think that the capacity of any single-flowered Stock plant to produce double offspring depends upon the absence of certain factors requisite for the production of a normal (*i.e.* single) flower from one of the two germ cells which united to produce the individual in question—that is to say, either from the contributing male or from the contributing female element. In the case in question it is the male element which lacks them. If these essential factors are lacking in both the contributing germ cells, the resulting individual is a double; if they are present in both, the individual is a single breeding true to singleness; but if they are brought in on one side of the pedigree, and not on the other, the individual is a single, some of whose reproductive cells will contain these factors while some will not. The last-mentioned type of individual will consequently give rise to a mixed offspring of singles and doubles. From the results of the mating non-double-throwing single as the female parent × ever-sporting single as the male we may then conclude that *all* the pollen of an ever-sporting single lacks the factors essential to singleness, or, as we may paraphrase it, carries doubleness.

If, on the other hand, the cross is made in the reverse form, the double-throwing-single being employed as the female parent, and the pure-breeding form as the male, only slightly more than half the resulting cross-breds are found to yield a mixed offspring of singles and doubles, while the remainder behave as true-breeding singles. If we are right in the supposition that a double results when both the contributing germ cells lack certain factors, then, since we have seen that these factors are absent from the pollen of the ever-sporting single, it follows that the proportion of doubles occurring among the offspring of cross-bred singles of this class represents the proportion of the *ovules* in the mother-plant, which lacks these factors, or, in other words, carry doubleness. This proportion, as stated above, is found on the average to be rather more than half, while the remainder—rather less than half—carry singleness. In the double-throwing singles, then, we have a plant whose pollen all carries doubleness, but whose ovules are mixed, about half carrying singleness and half doubleness.

This conception of the constitution of the double-throwing single type provides an explanation of the ever-sporting habit. In this way we are able to understand why all the successive generations of single offspring of any ever-sporting individual will themselves be ever-sporting, for every single individual in the pedigree has the same

constitution, having arisen from the same combination, viz., from an ovule carrying singleness and a pollen-grain carrying doubleness.

The practical outcome of this differential distribution among ovules and pollen of the factors causing the production of normal flowers is that the average output of doubles by an ever-sporting single remains constant, and that we are unable by changes in the external conditions to increase or diminish this output, just as we are unable by these means to affect such characters as the surface of the leaves or the colour of the flower. Singleness in the flower, hoariness in the leaves, colour in the petals, are equally the result of the presence of certain factors transmitted from parent to offspring, that is to say, they severally belong to the category of inherited characteristics.

In the case of the Ten-week races of Stocks the output of doubles amounts on the average to from 53 to 57 per cent. In a sowing here and there, especially if small, the number of doubles may fall considerably below or distinctly exceed the average, but these deviations from the mean are of the nature of accidental variations which with larger counts tend to disappear. Once a pure strain is obtained, the maintenance of a definite proportion of doubles in successive crops is, in fact, automatically assured, provided that crossing with non-double-throwing or cross-bred singles is prevented.

Where the aim is to obtain as many doubles as possible interest now centres round the question whether it is possible to distinguish, before sowing, the seed which will give rise to double, and so, by sowing only such seed, to eliminate the singles. For it is by seed selection only that we can now hope to achieve progress in this direction, since it has become clear that methods of cultivation have no effect upon this character of the flower, the form of which, whether single or double, is already predetermined in the seed. The statement is often to be met with that a higher proportion of doubles can be obtained from the lumpy irregular seeds than from those which are flat and regular in shape. This belief has possibly arisen simply from an association of ideas, connecting the regular symmetry of the single flower with the more regular and symmetrical seed-form, and is contrary to such evidence as is at present available. The shape of the seed is evidently mainly, if not wholly, determined by the dimensions of the pod, and by the spacing of the ovules (fig. 177). In some strains, as, *e.g.*, the wallflower-leaved cream form 'Princess May,' the pods may measure more than 6 inches in length and are wide in proportion. Even when these pods contain from 70 to 80 ovules, and all are fertilized, there is more than sufficient space for the seeds to lie flat without being compressed through contact or actual overlapping. Every seed in these pods is often quite regular and flat, yet there is no deficiency of doubles from such strains. On the other hand, in some of the short-podded strains the septum is so narrow, and the seeds are so crowded together, that, of necessity, they are often irregular and lumpy; yet these types yield only the normal proportion of doubles. Clearly selection of seed based upon shape cannot be

Fig. 174.—Petunia, single and double flowers.

The lower double is opened out to show central mass of additional petaloid structures and stamens which replace the ovary.

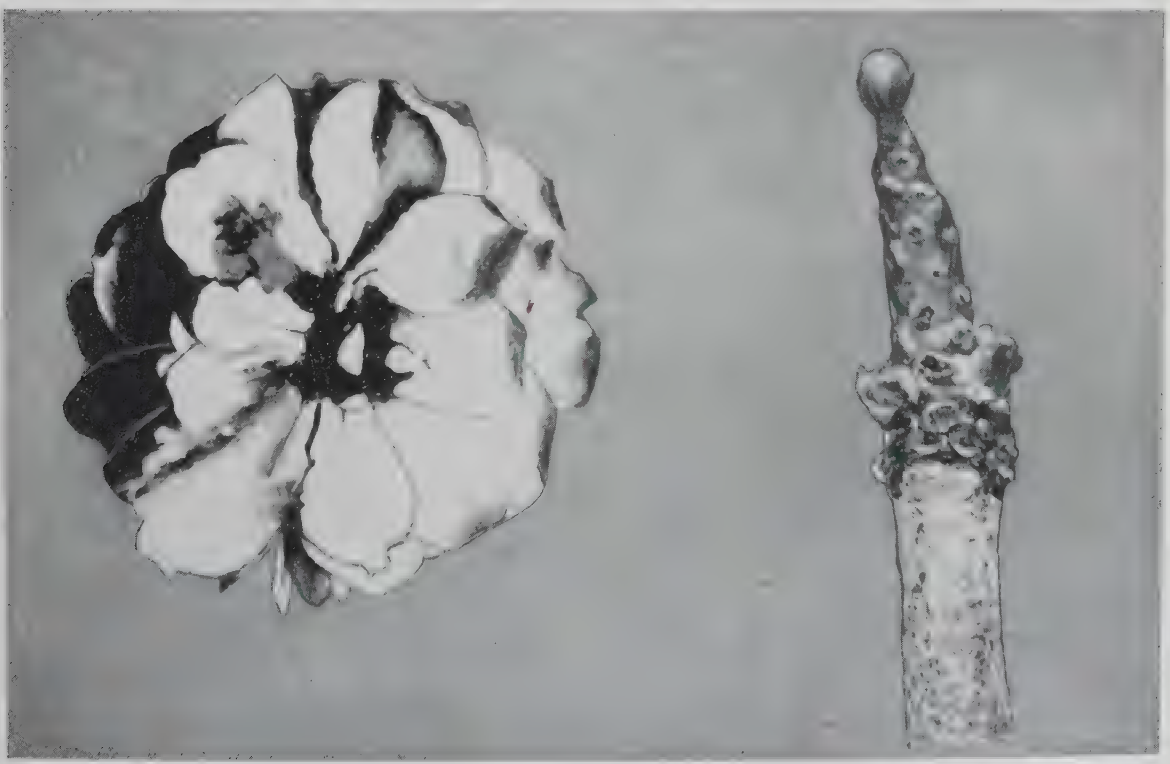

Fig. 175.—Stock (*Matthiola*) Flower and Naked Axis of Double Form.

The axis, from which nearly all the petals have been removed, shows the scars of insertion and two axillary buds (proliferation).

[*To face p.* 480

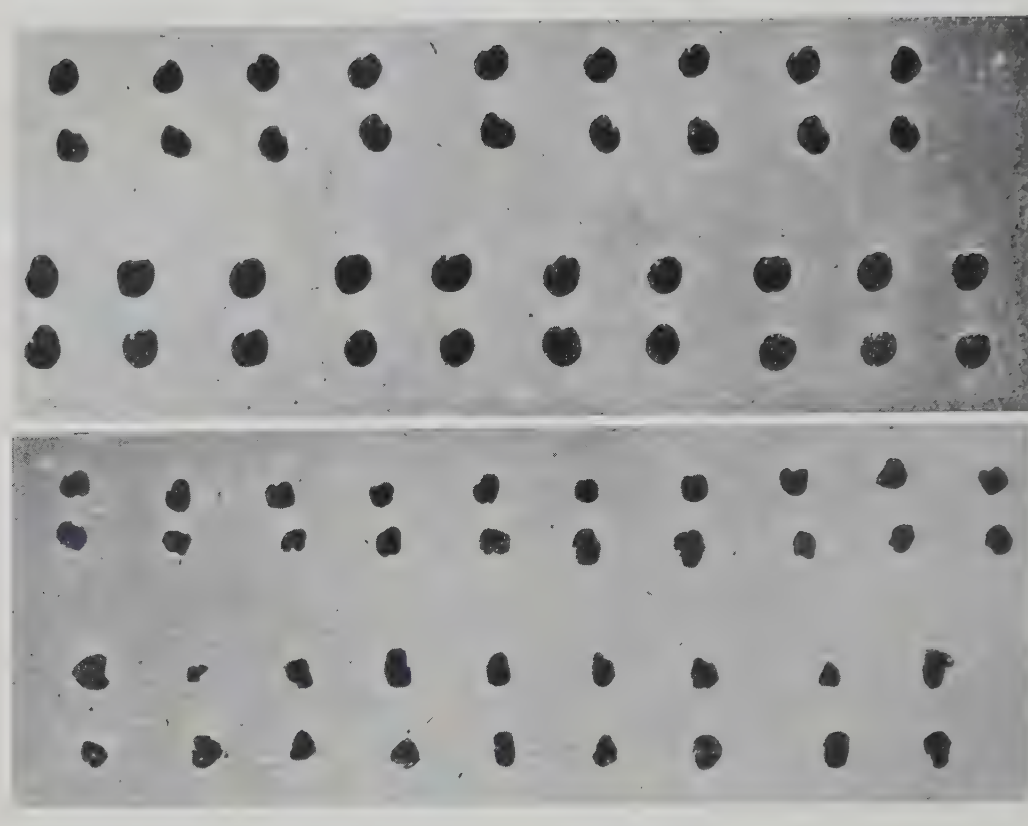

FIG. 176.—SEEDS OF DIFFERENT STOCKS.

Showing the similarity in shape between the seeds of one sulphur-white strain (rows 3 and 4) and those of a pure cream (rows 1 and 2), and between those of another sulphur-white strain (rows 5 and 6) and those of a pure white (rows 7 and 8). The seeds of the first sulphur-white strain can be sorted according to colour, so as to obtain an increased proportion of doubles.

FIG. 177.—THREE STOCK PODS. ONE VALVE REMOVED TO SHOW THE SEEDS.

Upper pods short, seeds irregular in shape through mutual pressure. Lower pod more than twice as long, though containing only about the same number of seeds. Seeds with considerable interspaces, and all regular in shape.

relied upon as a means of obtaining an increased proportion of doubles. Only in the case of one strain, so far as I am aware, is it possible by the method of seed selection to ensure an abnormally high yield of doubles, selection in this case being based not on the shape but on the colour of the seed. The strain in question is the curious form known as sulphur-white, a particularly interesting form, for it has the peculiarity of being ever-sporting in respect of a combination of characters. The single individuals of this race are white, but though *self*-fertilized they invariably yield creams as well as whites; they also yield a mixture of singles and doubles, the singles being white, the doubles almost all cream. In these respects material obtained from any source is found to behave alike. In regard to the seed characters, however, there is not always the same uniformity. Seed supplied by some growers is uniform and has the small brown, crumpled appearance characteristic of a pure-breeding white strain (fig. 176), while seed obtained from other firms is larger, more symmetrical, flat, and mixed as to colour, about half being rather browner in tint, and half yellowish like the seed of such a pure-breeding cream form as 'Princess May,' in which the seeds are also large, flat, and regular (fig. 176). This diversity of seed character points to a different origin in the two cases. It is not unlikely that the sulphur-white form may have arisen afresh from time to time by intercrossing, and that the immediate progenitor was not derived in exactly the same way in every case. Be this as it may, the fact that certain sulphur-whites yield a mixed seed which can be sorted according to colour furnishes us with a means of distinguishing among such seed those that will give rise to singles and doubles respectively. For the yellowish seeds are those which give rise to the creams, and, as stated above, the creams in this strain are all double. Hence, by selecting only the yellowish seeds for sowing we can obtain a crop consisting entirely, or almost entirely, of doubles, complete success depending upon the seed having ripened well, so that the distinction of colour is well-marked. In this way we can, if we wish, effect a fairly complete separation of the doubles intended for planting out, and the singles to be retained as seed-bearers, though a doubtful seed placed in the wrong category may result in a "rogue" here and there.

In the early literature on this subject the statement is frequently to be met with that seed which has been kept for a considerable period before it is sown yields a higher proportion of doubles than seed more recently harvested. My own experiments have confirmed this view in so far that it was found that if seeds are kept until almost all have lost the power of germinating the few survivors often give an exceptionally high proportion of doubles. This, however, must not be taken to indicate that the lapse of time has caused doubling to result in an individual which, if raised at once, would have been single, as was probably the idea of the early writers; but rather that the seeds destined to give rise to doubles possess, on the average, a slightly greater vitality than those which give rise to singles, and hence

amongst the last survivors the proportion of doubles may be higher than among samples of fresh seed. But this method of attaining his object will scarcely commend itself to the gardener, for he must still sow all his seed (since he cannot distinguish by inspection between the seeds which have died and those which still retain the power of germination), though his return at the best will be perhaps a plant or two here and there, and may be *nil* if the lapse of time has been too great.

So far then as Stocks are concerned, the position now reached is one which, if it precludes any hope of further advance in one direction, at least removes uncertainty and fear of possible deterioration in the other. If, on the one hand, we must relinquish the expectation of being able to raise the average yield of doubles by pursuing special methods of cultivation, we can, on the other, feel assured that an individual or strain giving the maximum output of doubles for that strain will continue to yield this maximum indefinitely, however unfavourable the conditions, provided that intercrossing, except with similar strains, is prevented.

Whether in other genera the degree of doubling, as well as the proportion of individuals showing doubleness, will be found in all cases to be inherited independently of the environment, or whether cultivation may have some effect upon the particular grade of doubleness which is reached, is a question which cannot yet be answered with certainty.

AN ENGLISH FRUIT-FARM IN THE MAKING.

By H. Hooper, F.R.H.S.

[Read October 11, 1912; Mr. A. H. Pearson in the Chair.]

I may say at the outset that although, by the title just announced, my remarks are to be restricted to " the making of a fruit-farm in Britain," yet, without digression from that subject, much of what follows is applicable to the making of a fruit-farm in any country where the hardy fruits of that country are, or may be, farmed for profit.

The designation " fruit-farm," though it has long been in use in oversea Britain and the United States of America, is perhaps somewhat novel to us.

The term " fruit-farming " may be taken to mean the cultivation of fruit-bearing plants for commercial purposes on the broad areas and broad, though well-defined, principles and practices of the " farm," as distinct from the limited area and less rigid principles and practices that legitimately pertain to the garden.

In fruit-farming proper all considerations other than business ones must be set aside; the picturesque must yield to the economic, and the practical dominate in design and execution.

Success in any commercial undertaking—success arriving at an expected and appointed epoch in the history of the business, and continuing smoothly thereafter—depends upon carefully conceived initiatory plans, full knowledge of what may be legitimately expected, and acquaintance with the methods whereby the " expected " is to be most surely attained: the putting into execution of well-conceived designs with a minimum of mistakes of the minor and reparable kinds, and without any of the great, radical, irreparable errors which foredoom an enterprise to failure.

If this be true in relation to business enterprises in general, it is emphatically true in regard to the business of fruit-growing. Probably no other commercial undertaking depends so absolutely upon a sound inception as fruit-farming does. Errors are bound to arise both in the scheme and in its execution—room for improvement there will always be, since advancing knowledge will better to-morrow what is held to be the best to-day—but the fruit-farmer who has to a reasonable degree equipped himself in theoretical and practical knowledge of his craft need fall into none of those great radical mistakes in the inception of his enterprise—in the making of a fruit-farm, that is—which, if they do not ruin the concern outright, at least cause delays and disappointments, and call for expenditure in money and labour that is additional, and might have been avoidable. Science and practice in horticulture are ever advancing—never more rapidly nor more surely than in these present days. We have to-day the benefit, as compared with cultivators of even a decade ago, of keener and better organized research and of

practical experience culled from far wider sources. Although "research" is very far from having exhausted its scope and opportunities, and cultural methods cannot be said to have arrived at a state of perfection which admits of no improvement, yet technical knowledge in the craft of fruit-growing is already advanced enough in this country to make it safe for anyone to engage in the industry who is prepared to profit by what research has already achieved, and to adopt such cultural methods as the best practical experience of the day recognizes to be sound. Furthermore, the fruit-farmer is well advised not only to start but to continue in close touch with this advancing knowledge, so that he may administer his farm in such a manner that its fortunes advance step by step with that increasing technical knowledge. It is not enough to set out in the right direction and with the correct equipment, but success depends upon continuing strictly in the right direction, and ever adding to the equipment at every opportunity.

Now to the "making of a fruit-farm." There are thousands of acres of land in this country upon which as yet no fruit-bearing trees and bushes are planted which are eminently suitable to the purpose of fruit-farming. These acres are not very easily to be discovered, and still less easily, perhaps, acquired, but it is worth the would-be fruit-farmer's while to seek them out, and acquire his portion of them, at some pains to himself. There are many acres also of the above description which are planted to fruit, and the fact of their eminent suitability is expressed in the flourishing condition of the orchards upon them and by the palpable prosperity of their owners.

Again, there are thousands of acres of land very much less suited to the purpose of fruit-farming, many of which are planted to fruit with varying results, and with which too often success has only been achieved at the cost of an inordinate expenditure in labour, time, and money. And again, there are acres innumerable that are wholly unsuited to the fruit-farm, acres to be carefully avoided.

To make a fruit-farm, then, which is to be the making, in a financial sense, of the fruit-farmer, it must be a first and foremost consideration to make it on the right spot; he must devote all his acumen to the selection of a suitable site. So many factors influence this matter of site that it is a very rare occurrence indeed to find a site which has no defects; but it is well within the bounds of possibility to find sites without radical defects, and with only such as may be, within economic limits, rectified or discounted.

Now, what are the "points" the intending fruit-planter must keep in mind when selecting land for a fruit-farm? We will consider them and their relative importance in effecting results, with the factors that must be taken into account when determining whether a given parcel of land will be suitable or otherwise. The very first thing to be taken into account is the position of the ground—its actual situation.

For the moment we will dissociate the idea and the word "soil" from our meaning when using the word "site," and consider the points of a good site, irrespective of the soils which may cover it.

Soils, within limits, may be altered—improved both as to their chemical and mechanical states—but site is an unalterable thing.

You cannot pick up a site and turn it round towards a point of the compass more favourable than that which Nature has allotted to it; you cannot elevate it above danger from cold nor depress it into shelter from tempest; you cannot transport it bodily to some spot miles, or even yards, away, thereby to improve its general amenities; you can do nothing but abandon it if its defects prove to be so radical as to defy remedy and render profitable fruit-culture impossible.

The actual position, then, is of paramount importance—position in relation to the points of the compass; position in relation to natural protection from prevailing winds; to elevation and its effect upon temperatures; the configuration of the surface, its slopes, and so forth—in short, the lay of the land.

Then, again, its position as regards facilities for the marketing of produce—the means of transport which serve the site (the roads), distance from railways, the cost of carriage of produce from the farm and of necessities for exploitation to the farm, are factors which gravely affect the business of fruit-farming, and must be taken seriously into account. They are factors, too, which must determine what species of fruits are to be produced, and may easily decide whether it be possible or not to cultivate any given species of fruits with profit at all.

In climatic conditions, as we know them here, it is well to have the aspect of a fruit-farm site with as much south and as little north in it as possible. From the northward, of course, comes the cold, which is the fruit-farmer's danger, especially in the spring of the year—not merely frosts and blizzards, but those steady cold currents of air, often some degrees in temperature above freezing-point, which by their long duration and persistency chill the soil, retard activity in the plant, and, when they occur at blossoming time, as they frequently do, are, I am sure, nearly as harmful as actual frost. The fruit-farm needs protection from these attacks, and a southerly aspect best affords it. A gentle slope to the south, then, is to be looked for—full south, if possible, or south-east or south-west, if not. South-east may be better than south-west, or vice versa, according to local conditions. In general a south-westerly aspect is to be preferred to a south-easterly one, as being the warmer; but, in the South of England, south-westerly gales are so prevalent as to become a factor to be reckoned with; and unless, by natural or artificial means, the orchard is screened from them, much damage may from time to time arise, especially in the autumn. Our markets are too often flooded with immature and damaged fruit, after a good sou'-wester. With an easterly aspect we have the danger of that damage which ensues to frozen foliage or blossom when it is suddenly subjected to the direct rays of the morning sun, and rapid, in place of gradual, thawing occurs. This result of an easterly aspect may not be of frequent occurrence, but it is worthy of consideration.

When inspecting the site we have to note carefully what protection

from inclemencies of climate are afforded it by natural means—by the configuration of the surrounding country and by timber—and if the natural protection be inadequate, it must be decided whether, by artificial means (the planting of wind-breaks), the site may be protected and made snug. There may be so many other points in favour of a given site that it is not to be passed over merely because some artificial protection is called for. We shall refer to this matter of wind-breaks again.

A gentle slope; why a slope? The advantages are: a better exposure of the plants and soil to the sun's action, better drainage (both surface and, as a rule, sub-drainage), and the facilitating of artificial drainage where that is necessary, and better atmospheric drainage. The slope, however, should be gradual and not excessive. On steep slopes the processes of cultivation are compromised, and denudation may occur with heavy rains. Then we come to the matter of elevation—the elevation of the site itself in relation to its local surroundings. Land may be at several hundred feet above sea-level and yet too low to be a good site for a fruit-farm or somewhere very near sea-level, and yet high enough.

The desideratum is that there be land yet lower than that on which fruit is to be planted, and that there be no "bottom" lands included in the site. Those bottom lands have their uses, but they are not for the fruit-farmer, and it is just as well for him that they be owned and used by some other sort of farmer. Into these low areas the cold air will be drawn off from the fruit plantations. They will afford the atmospheric drainage which is so essential. Were this more generally recognized than it is, we should hear much less than we do of crop prospects ruined by frosts, and of the necessity for the much talked of "orchard heaters."

Wind-breaks have already been alluded to. In selecting a site it must be carefully noted whether or not it is sufficiently protected by natural means—the configuration of the surrounding country, timber belts, its own hedge-rows, and so forth—from undue exposure to winds. Should it appear to be too exposed, the planter must make up his mind that one of his first operations will be to plant wind-screens. The direction and number of these screens will be decided by local circumstances and the configuration of the land to be planted. Some quick-growing shelter belts must be planted at least as soon as the fruit is planted, preferably before. While an airy position is highly desirable, a wind-swept site is impossible. The planted wind-break is in my opinion to be preferred to the "hedge"—generally the all-prevalent mixed hedge—for many reasons.

The wind-break can be raised in exactly the correct position to be most effective and it can be cultivated and controlled; whereas the hedge is a harbourage for weed and insect pests of all descriptions.

The best species of trees for wind-break purposes is a matter on which opinion is very varied. Many advise the use of fruit-bearing trees of the hardier sorts, holding that the crops they produce are a set-off to the expense of their institution and maintenance. Others

hold, and probably rightly, that this is questionable economy, since fruit-bearing trees to be serviceable at all as a wind-break must be grown under conditions which induce crops of fruit inferior in quality and quantity, and, more important still, under conditions which are propitious to insect and fungus pests. It is difficult to keep an orchard clean if the wind-breaks and hedges are breeding-grounds for pests. Such shelters must be sprayed as assiduously as the orchard itself, and from the very nature of their growth to spray them effectively is well-nigh impossible. In my opinion, the most serviceable wind-screens are those of poplars (Black, or Lombardy poplar), planted in double rows four feet apart diagonally, as screens on the east and west of plantations of fruit; and in three, or even four, rows along the northern boundaries. These poplars are hardy in the extreme, will grow almost anywhere and grow rapidly; are practically free from pests injurious to fruit trees, are easily controlled, the ground can be kept clean at their feet, and when planted as described, and headed back at the required height, form a wind-screen, even and unbroken, of a very effective kind.

The questions of marketing facilities, accessibility, and the quality of roads, the water supply, the suitability of existing buildings (if any) to the purpose of fruit-farming need not be dwelt upon here, but they all have an important bearing on the value of a site and a direct relation to the capital cost of the undertaking.

Having dwelt, perhaps at too great length, upon the importance of careful examination into the good and bad points of the actual site of the proposed fruit-farm, and taking it for granted that a given site has successfully passed the test of that examination, it is time to consider its soil. And the investigation into this great factor to success—the suitability of the soil—cannot be too thorough. There is but one way to discover the true character of soil—that is, to examine it with the aid of a spade. Surface indications are very misleading, and the history of farm lands as given by the farmer is not always to be relied upon. The fruit-farmer needs to know intimately the character of the soil he has to deal with—its qualities, chemical and mechanical, its depth, and what it is on, the subsoil. All variations in its qualities he must discover and allow for, and profit by his knowledge of them when selecting the positions on the farm which will best suit the various cultures he intends to undertake.

Over a site of very limited area there may be considerable variation both in surface-soils and subsoils, so that a perfunctory examination may easily lead to subsequent surprises and disappointments. The planter should know all about the soil of every acre to be planted; therefore he must prospect with the spade to the extent of digging at least one hole in each acre all over the site. In this way he will detect any variations there may be in the character of top-soils or subsoils, and arrive at a very accurate estimate of the average suitability of the soil conditions of the site to his purposes.

To define ideal soil conditions in this connexion is no easy matter;

opinions differ widely on the point. A soil that may be ideal for one species of fruit may be only fairly good for another—in fact, the selection of the species of fruit to be planted must in no small degree depend upon the soil conditions available.

But, as already said, soils are amenable to treatment and alteration to suit the purposes of the cultivator—a very fortunate circumstance, and one to be intelligently taken advantage of. The point, then, is to find conditions of soil which require only such alterations both in their chemical and mechanical qualities as come well within economic bounds. The nearest thing to perfection in soils for the grower of hardy fruits is a medium loam of good depth—say three feet—on a subsoil sufficiently porous to absorb the superfluous moisture of the surface, and yet retentive enough to hold moisture in reserve as a reservoir, to be drawn by capillary attraction to the surface soil as it requires it.

"Loam," as COUSINS puts it, is a blend of sand, clay, and humus; a medium loam is one in which neither one nor other of the constituents too markedly predominates.

With such a soil we get the maximum of good chemical and mechanical possibilities. Now the mechanical condition of his soil is a very important factor in the fruit-farmer's business—a soil that is easily worked, tractable, a soil that will be workable with little delay after rain, is of much greater importance to the horticulturist than to the agriculturist.

The cultural processes in fruit-farming are very numerous and continuous, and none of them admit of long postponement; they are so interdependent that delay in the performance of one means delay, and perhaps omission, of others, and that "regularity" which is essential to the best results is upset.

The fruit-farmer, with horse implement or hand implement, has always something to do "on the ground"; ploughing, scarifying, hoeing, spraying, pruning, manuring, fruit-gathering, follow each other in quick succession if the ground is to be kept in a high state of cultivation, the trees and bushes in health and productiveness, and the crops gathered at their best; so that the ground should be of such a nature that all these cultural processes may be carried through at their due season and not compromised, nor perhaps neglected altogether, because the character of the soil impels delay. The stiffer and more retentive soils, although they may be richer in plant-food than lighter but more tractable ones, are not the best for the fruit-farmer's purpose. To find the ideal surface-soil upon an ideal subsoil is not by any means easy, but it is well to have an ideal in mind and get ground as nearly approaching to it as possible. The planter will be fortunate indeed who finds a soil that needs no amelioration of its mechanical condition, and to improve his soil in that respect should be the aim of every fruit-farmer. There are recognized means whereby soils may be lightened or stiffened—the use of lime, ploughing-in of cover crops, judicious drainage, and so forth—and it is work that will

be found worth the doing. As to the chemical properties of soil, it is axiomatic that plant-foods become exhausted by the continuous cropping of land, and "manuring" must be resorted to sooner or later by the fruit-farmer as surely as by any other cultivator.

Site and soil conditions having passed the test of careful investigation and the property become destined for fruit-farming purposes, we may now briefly consider what further has to be done to enable it to fulfil that destiny. Here it may be said that land which is to be devoted to fruit-culture should be taken in hand by the fruit-farmer as many months—a year is not too long—before the time of actual planting as possible. All hurry should be avoided, so that the preparation may be really thorough. Thoroughness in the preparation of the orchard site means future prosperity to the orchard, and the preparatory processes take time. The land to be prepared may be arable or grass land; if the former, the processes of preparation are less exacting in expenditure of time and money, but if the site is in grass, then the first process is to get rid of that grass. The modern commercial orchard is never planted in grass.

In dealing with grass land, the first step is to put in a plough that will cut the sod cleanly at a depth of four to five inches, and turn it completely over, burying the green and exposing the roots, the land afterwards lying as flat and ridgeless as a skilful ploughman can leave it; and it is astonishing how very skilfully the process is sometimes performed. Weather conditions will determine how long it will be before that grass is destroyed and the land arable, but if that first shallow ploughing has been well executed, a few weeks of dry summer weather, or a few frosts in winter, will serve to kill the grasses completely; and in that dead sod the fruit-farmer has a very valuable asset—humus.

Land which has been subjected to the ordinary purposes of general farming, although it may have been quite well "done" in the light of that purpose, it may be taken for granted has never been sufficiently well "done" for the purpose of fruit-growing; and the question of "preparation" we are now dealing with embraces as a preliminary measure a thorough deep cultivation. Everybody knows that "trenching" is the first process in the making of a garden; so is it, or its equivalent, in the making of a fruit-farm. Trenching by spade over any extended area—even the area of a very small fruit-farm—is too costly a process to be thought of. The fruit-grower must employ steam or horse-power, and either, when properly applied, affords a very efficient substitute for the spade. If available, steam-power is to be preferred, as being both more expeditious and cheaper than horse-power. When the area to be treated is one of fifty acres or more it is generally possible to obtain the services of a steam-ploughing and subsoiling plant.

What is to be aimed at is a thorough working of the soil to the greatest depth the implements can achieve, the object being to turn the surface soil, as in ordinary digging and ploughing, to the depth of a foot, and to break and stir the subsoil thoroughly without bringing

it to the surface. With an efficient steam-plant, this preparation may be effected by first ploughing with the gang plough and afterwards working it in two directions, at right-angles to each other, with the "subsoiler" (a huge scarifier), which will break average soil to a depth of two feet—and this at a cost of from £2 to £3 an acre for the whole process, including the cost of coal and carting of water, doing the work at an average pace of about five completed acres a day. It is obvious that this affords a very efficient "preparation" indeed, the effect of which will repay over and over again its cost. Failing steam, horse-power must be resorted to, and though more tedious and more expensive, may, when proper digging and subsoiling ploughs are employed, and sufficient horse-power applied, be equally effective. This preliminary deep cultivation is not to be avoided—it is essential; aeration, retention of moisture, penetration of warmth, the conversion of inactive stores of plant-food into available nourishment, are results of it. At this period in the preparation of the ground the matter of drainage must be taken in hand, and what artificial drainage is called for should be now executed. If the site has been selected with the judgment demanded, there should be little, if any, artificial drainage to do; but there may be corners and hollows about a very good "site" that are too wet, which at a trifling cost may be converted into sweet, warm ground equal in quality to the rest of the land.

No fruit-bearing plant will thrive under conditions of poor drainage, and if a plantation of no matter what species of fruit trees or bushes is to be evenly prosperous and productive the drainage of all parts of it must be evenly effective. Look to the ditches, see that existing ones are performing their function, and where necessary open up new ditches made carefully as to level and shaping. The fruit-farm should be well fenced in—wandering stock and wandering humanity do damage. Rabbits especially are very destructive, and if the district is rabbit-infested it is essential that all fences and gates be made rabbit-proof. A good rabbit-proof fence of the colonial pattern makes a very effective fruit-farm boundary; such a fence will keep out not only rabbits but all kinds of farm stock, and it can be erected at a cost well worth incurring in view of the security it affords.

We left the land in the condition of having been well surface- and sub-ploughed. A few good harrowings, if time permits, before it is necessary to plant it, will be useful as a "cleaning" process and in obtaining a good surface to plant on. Land cannot be too clean—too clear, that is, of weed-growths—and the cleaner it be before planting the less expenditure in subsequent years. A vigorous attack on couch, thistles, docks, bindweed, dandelion, buttercup, and such-like weed pests, executed before planting, will save much expense in the subsequent struggle against them. To plant any fruit upon dirty land is a mistake; to plant many kinds—strawberries and raspberries, for instance—before the land is clear of perennial weeds is a fatal mistake. Land can with comparative ease be cleaned before planting, and if the work be thoroughly done, then the subsequent "keeping clean" is easy, but to

clean after planting is a weary and costly task. Again, if time permits, and the land is thin and short of humus, as nearly all ordinary farm lands are, the waiting time may be very well occupied in sowing, and ploughing-in a green "manuring" crop, such as mustard or vetch; this will not merely improve the soil itself, but aid materially in cleaning it of weeds. Before a soil can be said to be suitable for fruit-farming purposes at all it must be shown that it contains a proper proportion of lime—and very few soils do. Test your soil for lime with the common muriatic acid test, and unless you obtain an active effervescence you may be sure that the soil is deficient in lime. The test will reveal in 90 per cent. of cases that there is insufficiency of lime and very frequently no lime. To be on lime, even, does not ensure that the surface-soil contains lime; and soils aforetime rich in lime may have become exhausted of it, so far as the plant-feeding surface soil is concerned. Time will not permit of a detailed account of the virtues of lime in fruit-farming: its effects are multifarious; lime is at once a plant-food, a chemical and mechanical agent, and a cleanser—in short, it is indispensable. Before planting, then, see to it that the land has a good preliminary dressing of lime; distribution by a horse-drawn lime-spreader, in the form of what is known as ground agricultural lime is the most effective and economical method of applying lime. Throughout the life of the fruit-farm periodical tests for lime should be made and when necessary dressings administered (in the winter, when the plants are dormant). And now we come to the all-important matter of planting—what to plant; how to plant; and when to plant.

What to Plant.—From the moment the decision to engage in fruit-farming is made this question looms large in the mind. Plans are made and unmade with frequency, and rightly so, for too deep consideration of the matter is impossible. In all probability the planning will not take a final and concrete form until the actual site of operations has been selected; again rightly so, for the site should be a strong factor in making a final decision. The "lines" of cultures to be undertaken must be largely influenced by the marketing facilities a given site affords, the length of time, and the means of transit required to get fruit to its market destination in sound condition. Soil conditions should be reckoned with in deciding what to plant, together with—and this is most helpful and important—a knowledge of the fruits that do well in the locality. Careful observation through the surrounding district will reveal valuable facts in this connexion; investigation of neighbouring gardens and farms, will show that certain kinds of fruit trees and bushes are on the average vigorous and productive, others less so, and again others averagely poor. In deciding what kinds of fruits to grow, the grower should be mainly influenced by his personal experience, and he is wise to confine himself at first to the cultivation of those he is most intimately acquainted with. His training has probably followed certain well-defined lines, or at least his knowledge, theoretical and practical, is sounder in certain

directions than others; inclination and business instinct, we think, will keep him to those lines, and anything in the nature of experiment will be wisely relegated to the future, when success warrants it.

Too many lines of cultures are to be avoided: to grow only one kind of fruit is to specialize, and to take the risks of specializing. A good plan is to grow such fruits as can be gathered and marketed in succession, the handling of two crops of an entirely different nature being at the same time avoided. By so doing the labour question is greatly simplified—the same body of casual labourers, pickers and packers, a body of a given number, being engaged at the commencement of the fruit season and carried through with it. Fluctuation in demand for labour causes fluctuation in supply and inferiority in quality; the prospect of steady work entices a steady and reliable type of worker. If the growing of small fruits—strawberries, raspberries, gooseberries, currants—is contemplated on any extended scale, the question of available labour for gathering must be carefully studied, and these fruits should not be grown on a big scale at all unless that question be settled. For limited areas of small fruits the neighbouring towns and villages can usually be relied upon to supply sufficient labour, and the inconvenience of obtaining pickers from a distance and finding living accommodation for them is avoided. In established fruit districts these matters arrange themselves; it is the isolated fruit-farmer who must be careful.

The matter of " kinds " settled, another of even greater importance promptly presents itself—the matter of variety. Of all the factors in successful fruit-farming probably no other is more potent than the selection of the " varieties " to be planted. You may go to all the pains and expense of growing a given fruit and growing it to perfection to find in the end that it is either worthless, or only worth, as a marketable commodity, half what another fruit of the same kind but of another variety would be. And all the pains and expense of cultivating the wrong variety are the same as those in the case of the right variety. The right varieties, be they of apple, pear, plum, raspberry, strawberry, or any other hardy fruits, are those which the markets want, and the commercial fruit-grower must study and bow to that demand. Generally speaking, the market asks for what really are the best varieties. From the commercial point of view there are far too many varieties of most kinds of fruits in existence, and the narrowing down of them is much to be desired. The commercial fruit-farmer, then, must be careful to stock his farm with the best marketable varieties. As to what are the best, even experts disagree, but only within the limit of saying one is better than the other when both are good. To plant all that are good would be in most cases to plant too many " varieties " of a given kind, a thing to be carefully avoided; but a studied selection can be made from the acknowledged good ones, and the indifferent and worthless varieties eschewed.

The species and " varieties " decided upon, the next consideration is to procure the stock; and how very crucial is the matter of stock-

ing the fruit-farm! The failure to plant sound, healthy, true to name stock may mean the failure of the entire enterprise; it will certainly mean a very serious set-back to it. Nursery stock should only be bought from those who have made a reputation as reliable nurserymen, and have therefore a reputation to lose.

When to Plant.—Autumn is the planting season, and the aim of the planter should be to get all his planting for the season done by Christmas time at latest. That may not be possible; time, perhaps, has been too short to get the land thoroughly prepared by the autumn. Then the planting should be deferred until the early spring, the trees and bushes meanwhile remaining snugly heeled-in in trenches made in sheltered positions. To plant in the depth of ordinary winters is to take considerable risks; roots exposed to cold air or plastered into their permanent positions in cold, wet soil have a poor chance of retaining or regaining vitality.

How to Plant.—The laying-out of plantations calls for plenty of forethought; the welfare of the plants, as well as facility and economy in working the farm, depend upon sound planning in this connexion.

It has to be decided which particular area is to be devoted to each particular kind of fruit, and the position allotted to each in which it has the best chance of doing well; the special demands as to soil and exposure of the various kinds being met in so far as the differences in soil and position over the entire site will allow. It may easily happen, for example, on a farm of no very wide acreage, that the land planted in apples would have better suited the currants, or both plums and raspberries would have given better results had the one occupied the site of the other. There is plenty of scope for thoughtful arrangement in laying out a fruit-farm. If wind-breaks must be planted, it is all-important that they be grown where they will serve their purpose to perfection, and, whenever practicable, the land devoted to them should at the same time be utilized as roadways, paths, and headlands. It has been said that fruit-farming is to be conducted upon broad principles and with strict consideration to economy. This implies expedition in cultural processes, coupled with the maximum efficiency at the minimum of cost. Hand-labour is costly and necessarily slow; on the fruit-farm it must be eliminated and horse-power substituted whenever and wherever possible. The plough must supplant the spade, and—except in the immediate vicinity of the plants—the hand-hoe must give way to the horse-hoe, or cultivator.

When these horse-drawn implements are worked by skilled and trustworthy workmen the result is not merely cheaper and infinitely more quickly achieved, but it is actually better in effect than the output of hand-labour usually procurable. In laying out the fruit-farm the plan of plantation must allow for horse-cultivation, and the rows of plants and plants in the rows be spaced accordingly, with ample headlands for the manœuvring of ploughs and scarifiers surrounding each plantation. There is no extravagance in this. Apparent waste of ground is repaid not merely in the economizing of labour,

but in improved trees and bushes and larger yield from each tree or bush of high-class fruit.

The virtue lies in the spacing. Horse-cultivation militates against overcrowding, and there is no more deadly mistake than overcrowding of fruit-bearing plants themselves, unless it be the overcrowding of growth in the individual plants. It is not the number of plants to the acre merely which determines the profit of an acre of fruit-land, but the health and productiveness of the individual plants on the acre. The maximum to plant is the greatest number of trees and bushes which can be grown—each and all with adequate air-space, rooting-area, and sunlight. The moment any plant is deprived of a generous allowance of these essentials to health and productiveness its vigour is impaired, its crops degenerate in quality, it falls an easy prey to pests, and becomes an unprofitable thing. Economy which leads the fruit-grower into overcrowding is very false economy indeed. When trees are spaced to receive their proper share in soil, air, and sunlight, and have been so shaped by pruning that air and sunlight have free circulation through them, then we have conditions which, if they do not defy insect and fungus pests, at any rate minimize their effect by allowing the spraying-machine to be used with efficiency. In laying out a fruit-farm it must be remembered that sooner or later the spraying-machine will have to be called into action, and where there is overcrowding, spraying effectively is very difficult, if not impossible.

There are various systems of planting, the best of them probably being that known as the septuple, as it gives to all the plants equidistance, permits of cultivation in six different directions, and allows of 15 per cent. more plants to the acre than the square system does without overcrowding. Thus, at twelve feet apart on the square system one gets 302 trees to the acre, and on the septuple 347. The system may be applied to the planting of any trees or bushes, from standard trees to currant or gooseberry bushes, and permits of interplanting of tree-fruits with bush-fruits. The practice of interplanting two or more kinds of fruits, so often resorted to, is to be questioned. The processes of cultivation demanded by a given kind of tree or bush on a given area, or its manuring, spraying, and crop-handling, cannot fail to interfere with, and strongly influence, plants of an entirely different species interplanted with it on the same ground, and one or both plantations may suffer. On the whole, it seems advisable to devote separate parcels of land to separate cultures in permanent plantations.

The marking-out of the ground for planting is performed in various ways, but for accuracy—at some little additional cost perhaps in time and labour—no method excels that of using two accurately marked wires—one as a base-line, giving the distances of the rows apart, the other, worked at right-angles to the first, giving the distances apart of plants in the rows. A peg at every mark will fix the exact position of every plant. Accuracy in planting is not only good for the sake of appearances, but it facilitates efficient cultivation.

The actual planting of ground that has been carefully pegged out

is rendered very simple by the use of a "planting-board." With this contrivance no sighting into line of the plants is required; every plant will take the place automatically of the peg which marked the position intended for it; and not only is perfect alignment assured, but also the proper level at which the tree should be planted is guaranteed by the use of this simple but invaluable contrivance.

The actual process of planting a tree or bush presents no difficulty if a few salient principles are kept in mind. The depth and width of the hole is regulated by the size of the plant and the spread of its root-portions. In land that has been thoroughly prepared, the hole need be no larger than is necessary to comfortably receive the root-system of the plant, allowing the roots the same relative positions they held before the plant was lifted, and the stem to be covered to the exact point at which it was exposed in the nursery.

Plant rather above the general level of the surrounding soil; never below it. It is easier to pull soil around a plant that may be set a trifle too high than to correct the saucer-like depressions and their malignant influences upon the plant which are due to low planting. In soils retentive of moisture, plant high.

Before any plant is put in place the root-system must be examined and all damaged roots carefully cut back to the points at which they are sound, with a clean cut on the under-side. Plant carefully. With a little practice and the aid of a planting-board it is possible to plant very well and yet very quickly. The root-systems should be exposed as little as possible to the action of weather—cold, drying winds, or hot suns. Move plants as speedily as possible from the protection of the trenches to the protection of the soil in which they are to live permanently. Some method is called for in the organizing of planting work, and in ratio to good method in the control of it will the work proceed with smoothness and efficiency.

One cannot treat the question of orchard-planting to-day without taking into account the comparatively new factor which arises from increased knowledge in the matter of cross-pollination in fruit-bearing trees, and its effect upon crop-returns. Once this matter had but an academic interest, now it is of great commercial importance. Scientific research, supported by practical experience, has revealed that many varieties of fruit-bearing trees are practically self-sterile, and so worthless from the "constant income" point of view, if dependent only on their own pollen for impregnation, and others only partially self-fertile; and it is more than suspected that in all cases crop-bearing is improved both in quantity and quality when cross-pollination between varieties takes place. It becomes, then, a matter of high moment to the fruit-farmer that he affords every facility for the process of cross-pollination; and the aforetime method of planting large areas of each variety separately—so convenient for crop-handling purposes—must give place to the new method of intermingling varieties whose blossoming periods are contemporary, so that no tree is at any great distance from another of a different variety, thus affording every chance for

cross-pollination by wind-agency and insects. In laying-out and planting an orchard, then, this great factor in its future fortune must be taken into account. Any inconvenience that may arise from so doing will be far outbalanced by its good results.

With the land planted, the "making of a fruit-farm" may be said to be completed; afterwards comes "maintenance," and then the "marketing"—and these are other stories.

Within the limit of a single lecture it is hardly possible to treat a subject like the "making of a fruit-farm" in anything but a sketchy manner. There are so many principles and practices, so many points and opinions, embraced in the subject—most of which are important enough to be subject-matter themselves for books, to say nothing of lectures—that elaboration has not been attempted. I have confined myself to an effort to show that there are many things to be taken into serious consideration when contemplating the making of a fruit-farm, and much to be done before a fruit-farm is made; pointing out what is of paramount importance, and giving some idea as to how it should be done.

Thoroughness is the keynote to success—knowing what to do that is essential to be done, and doing it thoroughly. The means for knowing what to do are yearly improving in this country; channels for distributing practical information and reliable technical assistance are multiplying. This progress is especially marked in this very year, by the meeting of a long-felt want in the establishment of a "Branch" at the Board of Agriculture, whose duties are exclusively concerned with the interests of horticulture. This official recognition of the importance of horticultural industries, if tardy, is very welcome. The new Branch must be of great use and benefit to every line of business in horticulture—to none more so than the business of fruit-growing. Its potentialities for usefulness are very great, and will extend as the calls upon its services increase. The outlook for the fruit-growing industry in England is brighter than ever it has been before, and there is certainly encouragement in the existing state of affairs to those who have made or who are thinking of "making a fruit-farm in England."

Fig. 178.—Isole St. Leger in Lake Maggiore.

ON SCENTED PELARGONIUMS.

By Miss TROYTE-BULLOCK, F.R.H.S.

[Read September 10, 1912; Mr. J. HUDSON, V.M.H., in the Chair.]

SOME ten years ago in an idle moment I mounted a certain hobby, allured mainly by the fact of its being of an almost forgotten breed. On that delightful mount I have ambled for many a happy hour through the quiet lanes of a country life. It has led me along the pleasant paths of many new friendships. It has also carried me more than once on an exciting chase, ending sometimes in a successful capture, sometimes in a blank day and bitter disappointment. But I never imagined when I started riding my hobby that I should be landed in front of this extremely big and alarming fence—viz. giving a lecture before the Royal Horticultural Society on the subject. However I suppose the only thing to do is to screw up my courage, throw my heart over, and hope to surmount the obstacle without making too big an idiot of myself, while craving your kind indulgence for a very amateurish performance, for alas! I am no scientist. Mr. WILKS has asked me to give you my experiences on Scented Pelargoniums. That sounds rather a large order, for during ten years and more one goes through many and varied experiences. I think perhaps the best way to carry out his orders will be to divide what I want to say into sections, and I will try to be concise:—

1. History.
2. Collecting.
3. Classification.
4. Cultivation.

History.—You perhaps all know how Cape Pelargoniums came to be introduced into England. I mentioned the facts, as far as I know them, in my article in the R.H.S. JOURNAL, vol. xxxvii. But as probably few read it, forgive me if I briefly recapitulate them here.

Scented Pelargoniums seem to have been imported chiefly from Cape Colony, the native country of most of the species known to us. They came to England, presumably in the case of the earliest introduced (1690) specimens, by way of Holland, the Dutch being then in possession of the Cape; in or after 1795, probably direct to this country, the English fleet having been sent out in that year to support the Dutch supremacy at the Cape. Constant intercourse went on from that date between the two countries, until in 1815 Cape Colony was finally ceded to England.

That, I think, will quite account for the following facts. From 1815, the date of the Cape annexation, all through the early years of the nineteenth century, there was a steady supply coming direct into

England of rare and curious species of Pelargoniums and their near relatives—Campylias, Ciconiums, Dimacrias, Erodiums, Geraniums, Grenvilleas, Hoareas, Isopetalums, Jenkinsonias, Monsonias, Otidias, Phymatanthuses, and Seymourias. But with all these off-shoots, if I may so call them, of our subject, we have little to do, though one or two I shall have to mention later on. From 1820 onwards nurserymen and private collectors seem to have rivalled each other in procuring rare specimens and producing new and beautiful hybrids, until at last from these charming and elegant—I use the last adjective advisedly—plants were evolved the series we know as Show or Fancy Pelargoniums. If you look through SWEET's "Geraniaceae," as I have been privileged to do lately in the Lindley Library, you will be astonished to notice the number of fine collections that existed in English country-houses at the date of that standard book—viz. 1820-28. To mention a few in my part of the world only, the West Country. There was one at Longleat, the Marquis of BATH's; one at Haldon, the seat of the PALK family; another at Luscombe, Devon; a world-famous one at Stourhead, formed by the Wiltshire antiquary and scientist, Sir RICHARD COLT HOARE, after whom a whole series of Geraniaceae, the Hoareas, were named; and, finally, the Earl of ILCHESTER's at Melbury House, Dorset, which is not mentioned in SWEET's "Geraniaceae," but a copy of the catalogue of which I possess, comprising 111 varieties, dated 1817. Now of all those collections in houses of which I know something, not one survives at the present day, and I have no doubt that it is the same in other parts of England. Where have all those rare and valuable specimens gone? My theory is that they were ousted by the mid-Victorian craze for Zonal and Fancy Pelargoniums, of the evolution of the latter of which I shall have something to say under the head of "Classification." My idea is that the existing survivors of the older and far more interesting Cape and Scented Pelargoniums are those which lingered on undisturbed in out-of-the-way and old-fashioned gardens, such as Mr. DORRIEN-SMITH's at Tresco Abbey, Isles of Scilly, the only place I know where the original collection is *in situ*—though I am told that Lady SCARBOROUGH's collection still flourishes in the original home of *Pelargonium Scarborovae*, 'Countess of Scarborough'—or which, when exiled from the fashionable garden of the day, found a home under humbler roofs, often those of cottages. Another possible reason for the disappearance of many beautiful varieties may be that, being hybrids, they have just died out in the course of years, or reverted back to the original stock, as we see so many modern hybrids do. Still, one would think that cannot have happened to over 300 varieties, which is the number, roughly speaking, of those of which I can so far find no trace. But even SWEET in 1824 says in "Geraniaceae," vol. iii. p. 299, *apropos* of *P.* × *odoratissimum*, "It is now become rather scarce, as are those of the old original species, none of them being now much cultivated, except a few that are thought essential for producing the finest hybrids." My own idea is that there are many more to be found in country places

by those who keep their eyes open. Only last month I came across two beauties in my own village, after having, as I thought, explored every garden and window in the place.

Still, up to the 'fifties there must have been people who were interested in their cultivation, for those years saw the invention of the "Shrubland" Series—'Shrubland Pet,' 'Shrubland Rose,' 'Shottisham Hero,' and possibly my 'Lothario' and 'Touchstone.' They were the productions of the well-known horticulturist, David Beaton, who was, I believe, gardener to Sir William Middleton, Shrublands, Ipswich, hence the name of the varieties.

So much for the history. And let me sum up this section with this bit of advice: "Keep your eyes open wherever you go, especially when passing cottage-windows."

2. *Collecting.*—The first step in starting a collection is to follow the classic advice of Mrs. Glass's cookery-book: "First catch your hare." As to the way to accomplish this. All collectors are proverbially brazen, and I myself plead guilty to having been extremely—shall we say *metallic*?—in some of my doings. Harmless old ladies have been assailed on their own hearthstones and blandished into selling treasured plants. Perfect strangers, who have for their sins possessed a coveted specimen, have been bombarded with begging letters. Kind friends have been badgered till they must have been sick of the sound of my name. And all have treated me with consideration and courtesy, with the exception of one old woman in a Belgian village, who drove me from her door with contumely, asking if I thought she was going, for the sake of my dirty silver, to rob "Le Bon Dieu" of a plant—and such a plant—which was destined to figure in the Corpus Christi Festival the following week. As I draw the line at committing sacrilege, even to get hold of a new specimen, I departed with my tail between my legs, and regret harrowing my soul.

So perhaps my experience No. 2 may be summed up thus: "Don't stick at trifles, and don't be shy of asking." For up till now it has been impossible to buy specimens from nursery-gardeners; either they have not got them, or those they have are named wrongly. The only chance hitherto has been the courtesy and charity of fellow-collectors which I have always found to be unbounded, provided one asks politely and *personally*. I have reasons of my own for emphasizing this last point.

3. *Classification.*—This brings me to one of the great difficulties of forming a collection.

There are a certain number of groups of Pelargoniums whose parentage and antiquity are beyond dispute. Of these the Cucullatums head the list with *P. cucullatum* of the date 1690, which a lady from the Cape told me at the Royal International Horticultural Exhibition grows all over Table Mountain. This I believe to be the parent of most of the Show Pelargoniums.

The next oldest group seem to be the Capitatums, of which the somewhat rare variety I have is, I believe, the ancestor, introduced

also in 1690. *Roseum*, *graveolens*, *Blandfordianum* are all well-known relatives, with others too numerous to mention.

Then there is the large group of Citriodorums, delightful, every one of them, to sight and smell. *P. grossularioides*, introduced 1731, is the oldest species I have been able so far to unearth.

The Quercifoliums, and their near relations the Denticulatums (where does one end and the other begin?), with *quercifolium minus*, a true Cape species, introduced 1774, and *denticulatum* (1789), at the head of the family tree, form another large and well-defined group.

And there is the modern group of 'Shrubland' hybrids I have already mentioned. No one could ever class them with anything but Scented Pelargoniums.

These groups are all distinct from each other, and fairly easy to discriminate. But many others are difficult to place, unless their parentage can be traced. And even so, it is not a light task, as according to SWEET they were hybridized in and in.

But it is when one comes to try to draw the line between the tuberous-rooted Cape Pelargoniums on one end of the scale and the modern Show Pelargoniums at the other, and make up one's mind as to how many and which are to be included in a collection of Scented Pelargoniums, that the fun begins. To start with the Cape Pelargoniums. They are undoubtedly the original importations, but many of them—*bicolor*, *ardens*, *fulgidum*, *pulverulentum*—are absolutely scentless. Yet if you study the pedigree of, say, *pyrethrifolium* ('Scarlet Pet'), you will find that one parent is *fulgidum*. If you therefore include the child, why ostracize the parent?

Again, we turn to the other end of the story. Half the old Show Pelargoniums are hybrids from a Scented Pelargonium on one side; and *P. cucullatum*, as I said before, is responsible for a very long family. So where one ends and the other begins is more than I can say, and wiser heads than mine must determine the limits of Scented Pelargoniums and Show Pelargoniums, and solve this puzzle for us amateurs; and also the other question of *nomenclature*, on which I touched in my former article. I look to Wisley to take these matters in hand, for I consider the classification and proper naming of specimens the two main stumbling-blocks in forming a collection. Mean while let me give the intending collector this piece of advice: "Never discard any real old variety of Pelargonium you come across. It may not be a true Scented Pelargonium, but it may help to throw light on the pedigree and development of some hitherto puzzling specimen." Before leaving this part of my subject I should like to call your attention to those specimens of the allied types of Geraniaceae which I alluded to just now as off-shoots of our main subject. Some of them will illustrate what I meant as to the difficulty of knowing what to include in a collection.

(1) *P. tetragonum*. I find this is given in SWEET as a *Jenkinsonia*—*J. tetragona*, date 1774. Its leaves are undoubtedly sweet-scented, so I include it in my collection.

(2) *P. carnosum* (Kew) is SWEET's *Otidia carnosa*. A good distinct specimen of the Otidias. SWEET says of it, vol. i. p. 98, "This plant, which is so very different from any we have yet published, is proposed by Mr. LINDLEY to form a distinct genus, which we have adopted; to it also belong *P. dasycaule*, *P. ceratophyllum*, *P. alternans* (*P. crithmifolium*), and some others." Up till now I have acquired no specimens of the Hoareas, Grevilleas, &c.

(3) Ciconiums are, I think, undoubtedly the forbears of our modern Zonals. *Ciconium umbellatum* is interesting as being a curious and, I believe, early form, but I have no idea what the date of introduction is. *C. crenatum* (1820 about) is a true Cape species, of which I possess a small plant, but unluckily it has refused to flower in time for to-day.

(4) *P. fulgidum*, which also refuses to flower when I want it to, is parent of several of the showiest Scented Pelargoniums, and is a case in point of what I was saying just now of the difficulty of drawing the line between Scented and Unscented. 'Rollison's Unique,' 'Ardens,' and 'Scarlet Pet' are all its progeny, crossed with some other varieties.

(5) *P. gibbosum*, the *P. glaucum* of Kew, is another I include as a sweet-scented variety, for it is very fragrant, but at night only. It is a true Cape species of an early date, 1712.

(6) *P.* 'Godfrey's Pet.' This is the most interesting modern hybrid I have ever come across, for after careful study I have come to the conclusion that Messrs. GODFREY, of Exmouth, have happened by chance on an old cross. This variety resembles in every respect the *P. obscurum* of SWEET, vol. i. p. 89. (Parentage unknown, raised from seed by Sir R. C. HOARE in 1821.)

(7) *P.* 'Miss Dorrien Smith.' This is interesting as one of the old varieties of the "Unique Section." It is the *P. Breesianum* of SWEET, vol. i. p. 64, and a hybrid between *P. angustifolium* or *quercifolium* and one of the round-leaved varieties unknown.

4. *Cultivation.—Cuttings*. The best months to take cuttings are February and August, and all the Citriodorums strike easiest in February.

Soil.—As a broad general rule, sand, peat or leaf-mould, and turfy loam are best. SWEET's proportions are equal parts of sand, peat, and turfy loam. But we find one part of leaf-mould to three of turfy loam, and one shovelful of silver sand to a barrow-load of this, a very useful and successful mixture. For the real tuberous-rooted Capes you want more sand, and to pot them less firmly.

Bottom heat is not necessary. We always strike ours in a cool greenhouse. I forgot to say, under the head of *cuttings*, that there are several of the Cape species which can only be propagated by tubers; such are *P. triste*, *P. pulverulentum*, and *P. ardens*.

Watering.—This requires great care. When in full growth water may be given fairly freely, but as soon as the plants begin to rest, err on the dry side; in fact, according to SWEET, the tuberous-rooted

varieties only require watering two or three times during the whole winter!

Draughts.—These are one of the worst enemies to Pelargoniums, and must be carefully guarded against. Draughts encourage the most troublesome pest there is—aphis.

Pests.—Aphis and thrip. For the former we fumigate with nicotine and syringe with plain water; for the latter we sponge the leaves with an insecticide, such as paraffin solution.

[Since delivering the foregoing lecture, Mr. J. HUDSON, V.M.H., has most kindly sent me the following notes on the cultivation of Scented and Cape Pelargoniums, the result of his long experience in growing this class of plants:—Miss Troyte-Bullock's remarks upon the soil induce me to say that I find finely-granulated lime to be excellent; it assists in keeping the soil sweet and open. Firm potting is most essential for the durability and healthy growth of the plants. In the winter I find it much better to keep the soil quite on the dry side in dealing with our large specimen plants; and small plants require a little more water in proportion; but it is better to keep them resting during the dull season of the year. It is a pity that no records are, so far as I know, available as to the history of many of these most interesting, if not showy, plants. When the present collection at Wisley is arranged into something like order we may probably get to know more about them—their needs, their uses, and their varied characteristics.—M.C. T.-B.]

THE VEGETATION OF THE ISLAND OF ST. LEGER IN LAGO MAGGIORE.

By MADAME TZIKOS DE ST. LEGER.

[Read December 3, 1912; Sir ALBERT K. ROLLIT, LL.D., in the Chair.]

THE "Isole St. Leger" (St. Leger Islands), or Isole di Brissago, the larger one, also called formerly Isola di S. Pancrazio, and the smaller one Isola di S. Apollinare, are situated about two miles from the Italian frontier, in the upper, or northern, part of Lake Maggiore, which belongs to Switzerland.

The larger island contains about 13½ acres and is 690 feet above sea-level, while the smaller one (about 100 yards distant from the first) contains only 7½ acres and is 680 feet above the sea.

The shortest distance from the islands to the mainland is something over half a mile, where communications, both with Switzerland and Italy, are of the best. The larger of the two islands has its own Federal postal depot, which renders intercourse with the mainland easy.

The temperature generally prevalent throughout the whole district very seldom descends below 15° Fahr., and still more rarely rises above 70° Fahr., and on the islands themselves the surrounding body of water is the cause of a still pleasanter temperature, as it mitigates alike the cold in winter and the heat in summer; a gentle breeze, springing up regularly on the lake during the whole of the hot season, renders a sojourn there most agreeable.

This mild temperature also accounts for the presence on the islands of such a diverse and almost tropical vegetation. And, in addition to the temperature, the great variety of flora seems also to be due to the different quality of rocks which form the subsoil of the plantations. These rocks, which, decomposed, seem to contain all the mineral food necessary to almost all plants, consist mostly of laminated micaceous schists.

As for the soil forming the upper stratum over these rocks, it had to be brought almost entirely over from the mainland, and could hence easily be adapted to the various requirements of the different plants. When I first took possession of the islands, they presented, with the exception of a few poorly grown oak trees, an almost bare surface, nor had they ever been properly cultivated before my time.

The early history of the islands dates from the time when, during the Roman dominion and the civil wars in the country, they served as a semaphore station for the townlets of the surrounding shores. Then some centuries later they became, after the Edict of Constantine, a refuge for the first Christians about the lake and, under S. Apollinare, possessed the first Christian church, which later on became the parish church of Brissago.

When under S. Ambrose about A.D. 400 the parish church was

moved to Brissago itself, both islands were in the Middle Ages transferred to certain convents of the Order of the "Umiliate," which, being judged to have degenerated and to possess property and houses altogether too rich and sumptuous, were in the sixteenth century abolished by S. Charles Borromeo.

Since then they have remained bare and uncultivated, having only at intervals been taken up and then again abandoned until I saw and fancied them in the year 1885.

But my then still altogether juvenile fancy did not realize what I was about to undertake, and those who happen to see the island to-day could never imagine that this now delightful spot in the midst of the most gorgeous and beautiful tropical vegetation was only a few years ago a barren and inhospitable stretch of flat land, swept by the winds and fully exposed to the inclemency of all weathers.

But my task, in transforming all this, has been a rude one indeed, as *all* has had to be done, from the roof over the old dismantled nunnery, to the walks, which did not exist, and, desiring to go over the place, one risked at every moment a stumble and fall into hollows well hidden under masses of brambles, the stems of which with time had become as hard and tough as iron ropes; not to mention the host of vipers rushing in all directions whenever one dared to disturb their long enjoyed peace.

Yet with all these drawbacks and what my friends used to call "my specially unfortunate fancy," the venture enticed me. I had just recovered from a severe illness, and the complete change of surroundings, the balmy air, the entire absence of dust, and the unusual interest and delight, put me on my mettle to create myself a home on these desert rocks emerging from the water, and worked miracles with regard to my then still very doubtful health: I recovered it swiftly, nor have I since had a relapse of the lung troubles from which I was still suffering when I became possessed of these islands.

The first steps, though, were the hardest, and obliged me to work almost incessantly.

To make the old walls of the nunnery on the large island habitable, so as to be able to live on the spot in order to supervise the works personally, I began by having a good strong roof put over them, and provided the house with first-rate doors, windows, and blinds to keep out the wind and glaring sun, which both played with the place at will; the walls were whitewashed, as they have mostly been kept since, and wooden floors were substituted for the stone ones found in a half-broken condition. But none of the walls were touched, as these, besides having a thickness of nearly three feet, were built in the ancient style—that is to say, instead of being built of large stones joined together with mortar, they are made of round pebbles kept together with double the quantity of cement, thus forming a concrete harder than the stones themselves, fearlessly facing any kind of weather. At the same time I had the old harbour repaired and a good way made leading up to the house.

Fig. 180.—The Gardens and the House at Isole St. Leger.

[To face p. 504.

Fig. 182.—Trachycarpus excelsa at Isole St. Leger.

All this preliminary work was done in less than two months, and then I migrated to what has ever since been my real home. All, except myself, *played* at colonizing, and my friends, from their point of view, considered my eccentricity (as they called it) the consequence of my recent illness. This seemed to be the general opinion also all round this part of the lake, especially when they saw me discarding the flat-bottomed boats, usually employed, but presenting very little security in rough weather on this lake, and providing instead some sea-going boats, supplemented also by a little $2\frac{1}{2}$-ton yacht for sailing purposes.

I had to be brave indeed not to mind and not to be discouraged by those "who knew," or "thought" to know. But I was quite happy at the time, and went on living in what I afterwards, from my own experience, found out to have been more or less of a fool's paradise, because I had not yet begun to make my garden. Still very young, I had never yet had the occasion to "plant" anything, and therefore could not know of the somewhat sour joy in store for me in the shape of my first experience of gardening and gardeners.

But, before describing some of my gardening experiences, I must first explain some of the structural features of the garden and how they shaped themselves quite naturally.

After a good and easy approach to the house had been discovered, the other paths and walks were laid out and built. I say *built*, as hardly any of them could be made without a strong sub-structure of stone walls, partly on account of the great and abrupt inequalities in the levels of the ground and partly from wishing to keep as near as possible to the water, so as to gain the maximum available space for future planting. And so the walk, affording an easy promenade round the northern part of the island, has been built on the very edge of the water; it is 7 feet high and three-quarters of it is pretty often under water.

Another walk, the broadest on the island, measuring 12 feet, and likewise completely built on a stone sub-structure, is cut out from the southern corner of the house (which, as well as all the other inhabitable buildings, stands $32\frac{1}{2}$ feet above the mean level of the lake) and leads in a gentle slope straight down to the water, affording a lovely view of the Italian part of the lake.

Then another of the principal walks starts from the same corner of the house and, passing through the middle of the island, finishes at the extreme western corner, ending in a terrace, measuring 90 feet by 51 feet, all clad with ivy (*Hedera Helix* var. *canariensis*) coming down from a height of 30 feet and sweeping the water, interrupted here and there by *Clematis montana*, holding its own amongst the ivy and literally covering it with its white flowers. Close to the entrance a strong plant of *Cotoneaster buxifolia* is just now (August) covered with its bright red berries, and would continue so for a long time were it not for the blackbirds disputing their ownership.

The view from this terrace is, of course, indescribable: the big

stretch of water, reflecting the blue sky on bright sunny days, or at night the glorious moonlight, such moonlight as can be seen only here: the mountains, encircling the whole panorama, dotted over by the variously tinted houses of the many villages scattered all along shore, and many of them perched almost as high up as the snow-clad summits of the mountains: all this makes this terrace the most desirable spot in all weathers, when the moon or the sun, the rain or the gale, afford such pictures as are not often met with.

Other, secondary, alleys cross the former ones, but not to any great extent (together they do not measure more than about half a mile in length). All these walks have been exclusively planned by me. I was prepared to have at least some of them corrected by a well-known architect, who had been called in to restore the house and see whether the surroundings were suited to the future buildings, but the architect remained satisfied with my work and, when he sent in his plans, it was I, on the contrary, who discarded them, finding them superficial and absolutely out of keeping with the sober and simple island and all its glorious but severe surroundings. So I kept my nunnery, only now and then adding small embellishments, but without disturbing its principal outlines.

As for the reason of my success in thus distributing the walks—a point which may interest others and perhaps even be of some use to those who, without any proper technical knowledge, but only with, so to say, a certain instinctive sense of perspective and beauty, are obliged to supervize the making of similar ones—it is of the simplest: they were planned and executed with the sole object either of absolute utility or necessity, or with the intention of obtaining a certain vista, or to lead to a certain spot desired to be as handy as possible. Thus, except for some roundings off, no specially intricate or useless windings had been thought out and, when these more or less naturally resulting walks had been completed, the necessity for fancy ones was absolutely discarded, as the spaces remaining empty between them happened to be just suited to the different groups of plants I wanted to fit in, and other spots were left free to receive the secondary buildings, such as outhouses, cow-stalls, greenhouse, hothouse, &c.

The very first plants, which naturally attracted a poor, ignorant, and incipient amateur gardener like myself, came to the island in the shape of a *Trachycarpus excelsa* and a *Cryptomeria japonica elegans* (a palm and a more or less red-leafed coniferous plant!). Though they were both planted by a highly recommended gardener from the neighbourhood, they were simply stuck into whatever little and unprepared soil was to be found in front of the house, and I, of course, went daily some half dozen times round them to watch their progress! The first of these plants is still alive, while the *Cryptomeria*, being less tough, turned yellow the first autumn and died. So this premature departure make me look round for a better gardener.

I at first hit upon a rather intelligent man, who had long been in a botanical garden in South America, and thus had a sufficient, though

only empirical, knowledge of tropical plantations. To him I owe the being rendered independent of the conventional choice of plants used (without the slightest discrimination) in the whole of this district. But this man was slovenly, inducing the workmen under him to be the same. This made work to be done over again, and after having lost me lots of plants, he caused me useless outlay.

To show to what an extent his carelessness went, I need only mention the following fact: in order, if not to follow, at least not to disturb the simple outlines of the nunnery, a formal row of twenty-two *Trachycarpus excelsa* was planted along the one side of the alley leading to the lake. These plants, when bought, were all of the same height. The ground to receive them was supposed to have been duly prepared during one of my absences from the islands, so that, when the plants arrived, they had only to be lowered into their places. All but one progressed equally well, but that one, remaining obstinately behind the others, spoilt the intended symmetry of the lot, so that it was finally decided to take it up and replace it by a new one as tall as the rest. When lifting it up, its main root was found growing inside the broken-off neck of a large bottle, which the poor plant had met with at about 1 foot below the surface and, as the sharp part was turned uppermost, the glass pierced constantly deeper and deeper into the root as it continued to grow: the man had either not moved the earth deeper than that one foot, or had thrown it back into the hole without any other preparation.

The result of all this was the opening of my eyes to the fact that, unless I myself, with even a superficial knowledge of things, could supervise those workmen, my garden would never succeed; and I was not long in finding out that it was useless to provide plants, even at a high price, if the planting was not properly done. So I began to study the subject myself as thoroughly as only a wistful amateur could contrive to do. I procured good gardening books, preferring primers, which taught me things from the starting points, and I subscribed to gardening papers, amongst them to *The Garden*, writing to and disturbing the then owner, Mr. W. Robinson, very often with what he must have considered the most futile of questions.

The consequence of all this was that I stopped my gardener short and began first and foremost to provide the most essential of all gardening requisites: good earth.

There was, as I have already said, none to speak of on the island, and the few poor, crippled, and stunted oaks were living on the very problematical quantity of food they found between the chinks of the rocks.

Thus, while the soil was being brought in and the walks finished, I began to decide on the choice of plants, according to the positions which they would have to occupy after the walks had been laid out, and the height of the plants, according to the level of the water.

There thus arose, about the middle of the island and extending on

both sides and as far as the very water's edge, a beautiful group of coniferous plants, including the following:—

Abies cephalonica.
A. concolor.
A. Nordmanniana.
A. Pinsapo.
Cedrus atlantica nivea.
C. atlantica semperaurea.
Cryptomeria japonica araucarioides.
C. ,, *elegans.*
C. ,, Lobbii.
C. ,, *monstrosa (Rovelli).*
C. ,, *nana albo-spicata.*
C. ,, *spiralis falcata.*
Cupressus Lambertiana (macrocarpa).
C. Lawsoniana, measuring 13 feet across its crown, which stands 5 feet above the ground.
C. ,, *sulphurea.*
C. MacNabiana.
C. obtusa filicoides (Nobleana).
C. obtusa lycopodioides.
C. obtusa Troubetzkoyana.
C. pisifera filifera.
C. pisifera plumosa argentea.
C. pisifera plumosa aurea.
C. sempervirens pyramidalis.
C. species, Hills of India.
C. ,, Kamaon.
C. torulosa glauca and *glauca pendula.*
C. torulosa majestica, over 69 feet high, the tallest of the group.
Dacrydium cupressinum.
Picea Alcockiana.
P. Engelmannu.
P. excelsa Clanbrassiliana.
P. excelsa pyramidalis.
P. Morinda.
P. nigra.
P. orientalis.
Pinus Strobus, P. excelsa, and *P. pumila*
Pseudolarix Kaempferi.
Pseudtsuga Douglasi and var. *glauca.*
Sequoia sempervirens albo-spica.
Thuya plicata.

All these plants, with the exception only of the naturally dwarf growing ones, are now 30 to 40 feet high.

To the south of this group a gentle slope towards the lake contains an *Araucaria imbricata*, a *Cupressus Lawsoniana filiformis elegans*, and

FIG. 184.—IN THE GARDENS OF ISOLE ST. LEGER.

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an *Araucaria Bidwillii*. This last, 15 feet high, with a trunk of over 6 inches in diameter, passes the winter covered with straw matting, with an opening only towards the full south.

The place now occupied by the Cupressus in the middle of the Araucarias formerly contained an *Araucaria excelsa*, which was still more vigorous than *A. Bidwillii*, so the gardener thought it would stand the winter even without cover, and left it to die in consequence. The same may be said of a *Brahea Roezlii glauca* and a *Pritchardia filifera*, which were both victims of the audacity of the gardener; they had become magnificent specimens and stood our winters wonderfully well, with only a thick layer of sand at the foot and matting as for the *A. Bidwillii*. In fact, after such a success, my motherly heart bled badly when I saw them gone.

Beyond the *Araucaria Bidwillii* stands first *Pinus longifolia* and *Sequoia gigantea*, and then comes the pride of the island in the shape of nineteen magnificent *Eucalyptus amygdalina*, which, planted twenty-two years ago, have now attained the height of 80 to 82 feet, with a maximum diameter of trunk of about 2 feet.

These Eucalypti had a rather trying youth, and are the survivors of many dozens. The belief here is general that this genus of plants, which in the south of Italy is almost always planted in swampy places, can not only stand the water, but that it is almost aquatic. This leads local gardeners to entertain the erroneous idea that they can stand submergence, and therefore can, without the slightest inconvenience, suffer the variations in height of water our lake is always subject to through the snow melting in the Alps and rushing down the rivers into it. The baby Eucalypti (rarely obtainable in nurseries taller than 3 to 4 feet) were planted at the very edge of the water, and therefore regularly submerged, and this, if only for a few hours, makes them turn yellow and die. The gardeners, though, would not admit that the water was the cause of it, until I insisted on having a small batch of them kept in tubs until they reached the height of about 10 feet; and these, when planted out, stood the water quite well.

They now look wonderfully well with their white trunks and the light green leaves, showing off well against the darker forms of the Coniferae behind them, and when their bark, which they throw off every year, loosens itself and hangs down in long streaks, one might imagine oneself walking under the lianas of a virgin forest.

In a corner, quite close to these last and almost in the water, half a dozen *Liquidambar styraciflua* have been planted, and the effect they produce in autumn, when their leaves turn all colours from bright yellow to dark red, is a very happy one. These plants are so accommodating as regards soil and position, and are therefore so easy to grow, that it is difficult to understand why they are not more extensively employed and met with in landscape gardening.

On the opposite side a small group of *Taxodium distichum* is to be found, but these, quite contrary to my expectations, are by no means a success: instead of having a straight and tapering growth, they

have spread in breadth and are irregularly branched, thus forming most ungraceful objects. It is only my extreme reluctance to do away with any plant that allows them to occupy such a prominent place. I can only suppose that their bad growth is to be attributed to the fact of their thin roots being incapable of pushing their way through the somewhat heavy clayey ground they will have found beyond the good imported soil they were originally planted in.

Following the Taxodiums are a dozen *Prunus Pissardi*, their red leaves contrasting well with the light green of the former, as well as with the small wood of oaks, which were almost the only plants I found upon the island. They also have profited by the improved soil all round, and in several places they have asserted their right of precedence, by enjoying the freshly introduced manure and good earth and strangling the newly planted plants intended to grow amongst them. They are now mostly portly subjects, and compensate well for their occasional egotism by delighting us with some delicious mushrooms (*Boletus edulis*) as large as ladies' hats, which grow freely under their protection.

Having reached this particular spot on the island, I am bound to describe another of its peculiarities, which is formed by a quaint kitchen garden, placed in a unique position—that is to say, within the walls of a half crumbled down establishment, built absolutely in the water on the submerged cliffs.

These dismantled walls rise 26½ feet above the water, while inside they measure only 9 feet in height, the difference being made up of pure sand. I had the southern side of the walls lowered to 3 feet, so that the whole surface of this kitchen garden, measuring 114 feet by 51 feet and forming an oblong area with a total of 6814 square feet, is well protected against the cold northern winds and at the same time exposed to the full sun, thus forming an ideal kitchen garden. The walls facing south have arrangements for protecting lemons and early peach trees. In the middle a reservoir has been built, into which the water is pumped from the lake by a good strong pump. This small surface of ground, laid out and cultivated on a rotation system, yields sufficient vegetables of the choicer and earlier qualities for our own table, and the remainder are procured elsewhere.

The ground of this now exceptionally good little garden consisted in the beginning of almost pure sand, and when I told the gardener that I intended cultivating vegetables in it he refused to do so and had to be dismissed, though not only for this. Being only accustomed to the diminutive gardens along the shore, he could not make up his mind to my transforming the whole place into pleasure grounds: planting only ornamental trees and shrubs, instead of vines and potatos, was, according to his idea, equivalent to nursing a white elephant. And so we parted, more to my satisfaction than to his.

In consequence of this I had myself to go and work there personally, also directing a couple of good workmen, and, with the help of plenty of manure, produced even in the first year, amongst other

vegetables, some cauliflowers (Neapolitan early giants) with heads nearly 1 foot across; the texture of these was somewhat loose at first, but became firmer the next summer, when I astonished my people with some grand *demi-dur de Paris* also. As to the earliest potatos, we had never tasted better than the 'Marjolin' produced in this light sandy soil. It is, of course, no use to investigate the cost of these "tours de force," as my object at that time was only to demonstrate that, with a little patience and some good will, vegetables could be grown even in pure sand.

The immense quantity of grubs and maggots found in this sand made my task, notwithstanding all the different remedies used, most difficult, until I left all these pests to the tender mercy of some tortoises, brought over from Kew (and afterwards found to have been taken there from here!), where I happened to see them roaming about in a similarly infested ground, and since these gentle little animals have taken possession of the place the roots of the plants have ceased to be damaged. These tortoises are, besides, wonderful fighters, and I wonder whether they generally possess this quality: they bang their respective shells against one another in such a frantic way as to make the sound of it reach from one end of the kitchen garden to the other.

All round the northern side of the island a garland of weeping willows encircles the deciduous trees, and the light yellow foliage, appearing before any other in the early spring, lightens up the whole passage for nearly a fortnight.

Many tall and straight poplars and maples come up wild, and grow near the water's edge along this northern side, and all these deciduous trees finish up with the veteran of the island, a huge lime-tree, the age of which nobody can tell, as everybody has always seen it towering above the island. Only, when I entered into possession of the islands, this colossal tree was nearly bare up to three-quarters of its height and even had a somewhat meagre top, so that I decided to plant some quick-growing plants around it to hide the bare trunk. But no trees, except a *Cupressus torulosa*, could hold their own close to it, whereas the lime-tree itself expanded in breadth, and is now not only covered with lateral branches extending to the ground, but even sweeps it.

On this same side, and about half-way between the lime-tree and the principal house, a beautiful group of *Cupressus torulosa* extends as far as the very edge of the water; these have reached a height of 50 feet with a diameter of 18 inches, and beyond these, higher up and facing south, a couple of *Gingko biloba* expand their widespreading branches and fan-like leaves, turning bright yellow in autumn; and close to these again, a group of four of the grey-leafed *Cupressus pisifera* var. *squarrosa* break the monotony of the dark green of the *torulosa* behind them. In front of these several other Retinosporas follow the curve of the walk leading to the greenhouse, finishing up with

a grand *Cupressus pisifera filifera* sweeping the ground with its stringy branches.

The lawn in front of the house contains the *Phoenix dactylifera*, the only ones known to have been ever established on this lake. The largest one, a fine and sturdy specimen, measures 21 feet, and its trunk has a diameter of 3½ feet.

On this same lawn (of a somewhat roughish Italian texture) are to be found a *Chamaerops humilis*, several Phormiums, a *Yucca filamentosa*, and a *Nolina longifolia*.

The Bamboos are a special feature on the island, ranging from the huge *Bambusa mitis*, growing up to 36 feet high, with a stem 1 foot in circumference, to the small *pygmaea*, about a foot in height. The rather delicate *gracilis* has branches 15 feet long, waving them elegantly in the breeze.

Several *Cycas revoluta* are scattered over the island, the oldest having thrown out two heads, which grow more or less symmetrically out of a trunk 2½ feet high. The trunk itself has a diameter of nearly 2 feet.

Cupressus obtusa Troubetzkoyana is another beautiful, curious and rare conifer. The long pendent branches resemble green jet-work; it measures 11½ feet, and the trunk is 6 inches in diameter. It came from the famous Villa Ada at Intra, belonging to Prince Troubetzkoy, who gave me the mother-plant. It seems to be very difficult to propagate, but it seems also that a gardener, who had occasion to collect some seeds here a few years ago, has succeeded in obtaining some plants.

The huge leaves of *Musa Basjoo* throw in here and there a gay light green note. It matures its fruit this year.

The rockery all round the island is planted with *Cordyline indivisa*, *Trachycarpus excelsa*, and immense Agaves of all species; of these the blue *Franzosini* stands out well.

Besides these chief features of the vegetation on the island I could enumerate many other plants, as *Acacia dealbata* and *A. cultriformis*; various *Acer japonicum*; Hydrangeas in colossal clumps; Azaleas, *Magnolia*, *Myrtus grandifolia*, just now (August) in full flower; and many, many others, not forgetting a very artistic, though small, piece of rockery, partly covered by a huge *Yucca*, which, instead of growing upright, is creeping over it just near the principal entrance.

And the roses? I really could not tell how many there are at present scattered in groups and borders all over the island, nor what most of the newer ones are, as during one of my recent long absences most of the labels of the recent introductions have been lost through ignorance and carelessness. I can only say that there are many hundreds of varieties, and amongst these many beautiful old friends, which year after year and almost during the whole of it form the permanent coloured ornament to garden and vases. In fact, winter does not seem to exist for them here, as 'Maréchal Niel' has been found flowering on Christmas Day against the sunny wall of the house,

FIG. 186.—EUCALYPTI AT ISOLE ST. LEGER.

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Fig. 187.—Conifers at Isole St. Leger.

Fig. 188.—Conifers. Dracaenas and Yuccas at Isole St. Leger.

Fig. 189.—Cycas revoluta at Isole St. Leger.

Fig. 190.—Musa Basjoo at Isole St. Leger.

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and the Bengals, with 'Laurette Messimy' leading them all, have been cut outside in the month of February.

I do not speak of herbaceous plants, as there are hosts of them, and next spring I hope to add a long planned herbaceous border some 300 feet in length, which I have up to now been prevented putting into execution on account of long absences from home.

As to this last, my home, or what I call my "hermitage," it has become a very cosy old house with many comforts in it, and when at home I always try to add some fresh ones.

Inside of it I have collected, during my many and varied travels, all sorts of curious and valuable new and ancient objects, which, having taken up their permanent places all over the house, keep me company above all during the long winter evenings, when, quite alone, I look upon them like old friends without whom I should no more feel at home, as they tell me many tales, all lived, and suffered, or enjoyed.

Then, when in the morning I walk out in the open, I look with a more or less motherly pride at all around me, but also rather with a certain preoccupation at all that remains still to be accomplished in order to make my endeavours become, if only in the slightest degree, more worthy of the small bit of earthly paradise amidst this unique nature, which I have had the fortune to meet with and have been allowed to improve.

Sir Albert Rollit, in moving a vote of thanks to the authoress and to Mr. Wilks, the reader of the paper, said the work of both had been admirably done. His one qualification for presiding was that he knew Maggiore as well as he knew Piccadilly, the result of having stayed there with friends for many years, almost in face of these little islands, at Oggebbio, far from railways, and with the advantage of their yacht on which to explore the Lake. It was an exaggeration to say to each other, as they did, that they discovered a new Italian lake once a year, but there was a grain of truth in it; for instance, sailing home one day near these islets, some one on board said 'There is a lake at the top of that highest pinnacle.' So they brought up, and a man came off in a boat, who replied that it was so, and that he could put the party up on mules in five hours; so some went, and reported a most beautiful ultramarine lake well worth the ascent. And how many had been to Maggiore, yet had never seen the quite adjacent Lake of Orta, perhaps next to Garda the most beautiful of all the Italian lakes! A strange incident on that part of Maggiore was that every time they sailed they were boarded by the crew of a Swiss gunboat, who examined the ship for contraband, and who, while perfectly courteous, always asked the same questions to no purpose, and wasted a good deal of time better devoted to the admiration of the grandest, the most masculine, of the Italian lakes, the potential dangers of which, as he once experienced in rowing between Luino and Pallanza, when he nearly lost his life, were shown by the fact that one of such gunboats foundered in a storm on the Lake, and was still at the

bottom of it. Horticulturally, the paper had been very interesting. Effective sub-tropical gardening was easy on the Lake, and especially on some of the islands. But the climatic advantage of Maggiore over, say, the Lower Thames Valley was not so great as one would suppose, though the former had the advantage of more certain weather and temperature conditions, owing to its Alpine shelter. Still, the relative florescence was not far from contemporaneous, that of *Magnolia grandiflora*, for example, being closely so. Bananas, especially *Musa Basjoo*, did better in the open than on the Thames. It was claimed for *Olea fragrans* that its perfect habitat was on the shores and islands of Maggiore; Salvias flourished splendidly and had the best colourings; and there were many plants of an old flower which he much missed nowadays in our gardens—the *Gazania*—which had been seen by him to bloom best in Cyprus, and which, in its orange colouring, was perfect, though it closed early in the afternoon. Sir ALBERT said that he had been enabled by Mr. WILKS to make a large distribution of his Shirley Poppies—as also he had made and received many exchanges of other seeds and plants, for comparative experience in growing—on Maggiore, and they were most coveted and flourished exceedingly. He might mention one such place not far from the Lake—Desio—the fine English-looking home of H.E. Signor Tittoni, lately Italian Ambassador in London, where very much of what he had spoken might be observed.

Mr. MARTIN DEED seconded the vote, which was carried with acclamation.

[Figures 178 to 190 are from photographs taken in Madame Tzikos de Leger's garden.]

THE SENSES OF PLANTS.

By Rev. Professor G. HENSLOW, M.A., V.M.H.

[Read October 22, 1912; Mr. E. A. BUNYARD in the Chair.]

Introduction.—All admit that there is only one and the same kind of protoplasm or "physical basis of life" (Huxley), though it may vary somewhat in its chemical composition, and the cell nucleus behaves in a practically similar way in the production of cells in all organic beings. In most animals, however, there is a more or less well-developed protoplasmic nervous system, with distinct organs of sight, hearing, smell, and taste; but one, the sense of touch, is diffused over the whole body. In worms the sense of sight is similarly diffused; for earthworms come out of their burrows in the dark, and they return as soon as light is *felt* in the morning, but they cannot see it. Plants are similarly provided with senses. Thus the different sensations of light and of darkness are diffused over every green or uncoloured surface; but the former at least is localized in the chlorophyll granules.

In some cases special organs are constructed which are keenly sensitive to touch, as in many climbing and the so-called sensitive plants.

In insectivorous plants a sense of taste may be considered a characteristic feature; since the glandular structures, which absorb nutritious matter, refuse some things and utilize others, as will be explained.

In addition, something comparable to the sensation of thirst exists; for the tips of roots will grow in the direction of moisture, often overcoming difficulties in getting to it. Indeed, Darwin compared the root-tip to a brain!

As to the senses of hearing and smelling, we have no evidence that plants possess them, or that aërial vibrations are in any way capable of producing any recognizable effects in plants.

On the other hand, plants respond to the force of gravity, strains, stresses, &c., by building up tissues expressly adapted to meet and overcome them.

The Sense of Sight.—Unlike the diffused sense of touch, that of sight in animals is, of course, usually confined to special organs. Our own sight is normally capable of distinguishing certain rays of the sun, which appear coloured, as in the rainbow or solar spectrum, which, when they are all combined, constitute white light.

It is in this faculty wherein plants not only resemble us, but utilize the different rays for special physiological purposes respectively. They cannot "see" them, because they have no brains, but their "eyes" are the granules of green-coloured protoplasmic bodies, called chlorophyll, within the cells.

If, therefore, we consider the sensitiveness to light as equivalent to the sense of sight, all green parts of plants possess it; for no plant naturally living in bright sunshine can flourish in darkness, or rarely well even in subdued light.

The chlorophyll granules utilize the yellow and blue rays especially for the purpose of assimilation of carbon from the carbon dioxide in the air; while the red and violet rays especially, as well as to some extent the green, are required for transpiration.

The invisible heat rays, which form the continuation of the spectrum below the red, stimulate respiration.

Lastly, SACHS thinks he has discovered the use of ultra violet rays to be in the process of flower-making, at least in *Tropaeolum.*

Every plant naturally adapted to receive light, theoretically at least, requires an *optimum* degree for perfect growth and development. Probably this *optimum* is never obtained. On the other hand, an excess is common in deserts and a deficiency in forests. Plants have the power to a limited extent to reduce the former and increase the latter. Thus in deserts the leaves are very frequently covered with hairs, forming a sort of felt over the surface, or the cuticle is thickened and corrugated, dispersing some of the incident rays. Some even develop a superficial plate.*

On the other hand, if the light be insufficient, the superficial cells may take a sub-globular or convex form on the outer side. This, like the eye-ball or magnifying glass, concentrates the rays upon the chlorophyll granules collected at the bottom of the cell.

Lastly, in many cases, as of the delicate algae, &c., the chlorophyll grains can move away from the horizontal surface, if the light be too strong, and arrange themselves on the vertical walls, and vice versa when the light is feeble.

Another effect of too great a degree of light, is to make the green colour to acquire a yellow appearance. This is normally the case with the leaves of *Aucuba japonica;* for those leaves which are within the bush are of a deeper green and less spotted with yellow than those on the surface. Variegated shrubs, as Holly and Yew, have only the exposed leaves yellow, those below being green like the *Aucuba,* only in their case it is an acquired habit.

Another effect of light is seen in the alteration of the position of leaves. These endeavour to place themselves with their blades at right angles to incident light. This can be effected in different ways. Thus, in the common Laurel, the shoots project horizontally from the sides of the bush; these bear leaves in a *distichous* manner (or $\frac{1}{2}$); but on shoots arising vertically from the top of a bush the leaves are scattered (on the $\frac{2}{5}$th plan).

In the Yew, the short undeveloped shoots have the leaves scattered ($\frac{3}{8}$th plan); but they all lie horizontally on a lateral shoot, by *twisting their short petioles.*

Shoots with opposite leaves in pairs can cause all the leaves to face

* Schimper's *Plant Geography*, p. 59.

the light by the internode *twisting during* growth. Snowberry and Privet illustrate this procedure.

The Sense of Touch.—The sense of touch is exhibited by plants in many ways. Let us take first sensitive and insectivorous plants. The former type may be represented by *Mimosa pudica*. As soon as the tip of the compound leaf is touched the leaflets fold themselves together from the end to the base, and then the petiole droops.

The Sundew and Venus' Fly-trap afford good illustrations of the effects of touch. In the former, the tentacle-bearing glands around the margin of the leaf-blade bend inwards when the glands on the surface of the blade, which secrete a sticky fluid, are touched, whether by an inorganic or organic and digestible substance. So slight a thing as $\frac{1}{5714}$ part of a grain of hair caused inflexion. Nitrogenous substances, which alone are digested, are most effective.

The leaf-blade of the Venus' Fly-trap (*Dionaea*) bears three bristles on each half-blade. One or more being touched, the two halves instantly close up. The reader will find abundance of other interesting matters in Darwin's "Insectivorous Plants." I am only here concerned with that of sensitive living protoplasm being the instrument of movement in response to touch, as therein explained. As another example we find it developed in climbing plants. We all know how sticks are necessary for Sweet Peas; for the leaflets, which are mostly represented by tendrils, have become very sensitive to touch; so that as soon as contact takes place with a twig, by a branch of the tendril touching it, this twists round the latter. Previous to contact, preparations are made—thus the leaflets, having been all originally in one horizontal plane, have now only the midribs remaining; but to provide greater facility for catching, they grow out at any angle and are hooked, so that they assume the form of a complex grappling instrument. Moreover, the main shoot and tendrils "circumnutate," or keep "bowing around," so as to have a better chance of catching something.

In the Ivy, the climbing shoots have acquired the habit of growing towards the less illuminated side in preparation for climbing up a wall. Though the formation of roots on that side was undoubtedly *at first* due to contact, they are *now* formed on the darker side *before* contact; but such are not completed until contact is made, though they are at once formed when the apex itself reaches the wall.

In the case of the Virginia Creeper, certain flowering branches are converted into branching tendrils, by means of which it can climb up a trellis, &c.; but it subsequently acquired the habit of climbing up a rough surface; so the shoots now grow towards the darker side, and every branchlet of the tendril has a hooked tip which catches the roughnesses of the wall, causing it to remain until the tip has developed an adhesive pad. This, however, is never made *in advance* or before contact in this species.

In the Japanese species, however, the pads begin to be formed *before* the contact takes place, but are not completed until contact occurs. This state also obtains in some other climbers.

The tendrils of the Cucumber family, as a rule, have no adhesive pads; but M. NAUDIN discovered one species, *Peponopsis adhaerens*, which bore them. Another plant of the same family (*Trichosanthes*), growing in a frame, had its tendrils accidentally in contact with the brick wall. This at once developed adhesive pads; but it was not known previously to be able to do so.

It may be added that the tendrils of Cucumbers supported by wires lost their power of climbing.

The Sense of Taste.—If we look for organs of taste, we seem to find some analogies with ourselves in insectivorous plants. DARWIN'S elaborate investigations discover to us that the glands on the tentacles of the Sundew, just as in the case of our own glands, do not secrete any digestive ferments until they can be excited by the presence of some nourishing (nitrogenous) and digestible matter. Moreover, just as we can suffer from indigestion, so many things, such as hair, cannot be digested by these plants. To these must be added fat, oil, starch, and cellulose; for, as it is not the function of our gastric juice to digest these things, neither is it with the Sundew. The glands, so to say, "taste" the difference. It is only nitrogenous matters which they can consume.

Hence, it was discovered that the ferment is akin to pepsin, and not like the salivary glands which undertake the duty of making starch soluble and digestible. As DARWIN has so fully described the process in his book called "Insectivorous Plants," the reader is referred to that for further information.

Sensitiveness to Forces.—Besides actual pressures, strains, stresses, &c., felt by organisms when material bodies are in direct contact with them, plants *feel* the effects of forces when no material body is actually pressing upon them. This is especially conspicuous in the case of gravity, which is always trying to pull every erect plant down to the ground. Since, however, it has to grow upwards, it must resist this pull. It is, therefore, sensitive to the direct action of gravity, and so responds to it by building up the requisite tissues in order to support its own weight, *i.e.* to resist the downward pull of gravity. It has been shown* that dicotyledonous stems are constructed on the principle of a circular set of girders, the circumferential vascular bundles supplying the flanges, and pith representing the "web." When the former are in close contact they form a compact cylinder, the web being now dispensed with whenever a rapidly growing stem becomes hollow, as in many herbaceous plants. But if they be long, a weakness arises; for they may be broken sideways by the wind or their own weight. To resist this strain, transverse diaphragms are constructed at the joints, as in a straw. An interesting form of this is seen in some Bamboos, in which the diaphragm is cup-shaped. This allows for a *combined, or circumferential, downward pull*, which resists the tendency to break the internode across above it. In the tropical woody-stemmed climbers, called "Lianes," various mechanical contrivances are adopted to meet

* Kerner's *Natural History of Plants*, p. 724.

the pulls and strains to which they are subjected. A characteristic form of some genera, as *Bauhinia*, is ribbon-like, but with alternate bulgings of a cup-like form. These meet any strains acting *laterally*, just as the cup-shaped diaphragm of the bamboo exerts a pull downwards. They are, in fact, "arches" on opposite sides. In the "Monkey-ladder" (*Caulotretus*), besides the flat stem with its attendant cups, Nature has stiffened it by placing flanges at the sides, thus making a girder. A *Bauhinia* stem, without flanges, is quite flexible. Flowers, especially those constructed to secure cross-pollination, abound with special adaptations to external forces; for when the insect alights on a flower, its weight has to be borne as well as other forces. *Salvia* affords an excellent example.*

Do Plants show Psychological Phenomena?—The preceding facts suggest the question—Can we detect anything of the more abstract qualities of a sensitive nervous system in plants? Have they thought, reflection, initiation of ideas, instinct, reason, and intelligence? Let us consider what an engineer may have to do. Having first had it described to him what is wanted to be done, he executes most of the above mental qualities before he begins to construct the work—say, the Thames Embankment. Does a beaver follow the same series of psychological processes? He *sees* the water and the *place* where his dam shall be. He cuts down trees for the purpose, putting the logs in their right positions, and the dam is made. Where is the difference between an engineer and the beaver? The latter is an *automaton*, the engineer is *not*. The *instinct* to make a dam is hereditary, and the beaver will try to make it elsewhere, as in the case of a certain tame one. Its owner supplied it with various articles in a room, and it made a "dam" in the corner. Similarly a puppy brought up by hand, when first given a biscuit, tried to bury it in the wooden floor in a corner of the room left uncovered. After having well scratched the boards, it proceeded to ram the biscuit down with its nose. It walked away quite satisfied. Reason was non-existent in the puppy, only instinct was present; so that neither animal could perceive that "circumstances alter cases."

These two instances show that it was *at first reasoning* (but only with *concrete* objects, *never* with *abstractions*) that first led the ancestral beaver to make a dam and a dog to bury bones; but both have now become automatic instincts. Now, plants, having no power of thought or reflection, cannot *consciously* initiate an act of construction. Nevertheless, plants *do* initiate all sorts of constructions of a *purposeful* nature, a few only of which have been described above. It is *Life* which *responds* to external stimuli and proceeds to build up tissues and organs to meet the case, whatever it may be, whether of a plant or animal.

We cannot go farther than to recognize *Life* as the *Director* of the lifeless, physical forces in organisms, which moves the lifeless matter derived from food, and thereby builds up everything that is wanted,

* See *Introduction to Plant Ecology.*

the resulting structures being often far more complicated than a watch.

Conclusion.—Whether, therefore, we examine animals or plants, we cannot fail to see that both, during growth and development, differ from inorganic bodies by exhibiting *results* which, when compared with precisely similar or analogous works of man, we usually regard as proofs of intelligence. The only property we know of capable of effecting this is life; but whence life came is *scientifically* both unknown and unknowable.

SOME EXPERIMENTS WITH CONTACT INSECTICIDES.

By J. Charles Johnson, M.A., M.Sc., Biological Institute, University College, Cork.

Insecticides may be divided into two classes: those which have to be eaten to cause death, and those which kill the insect when applied to its external surface. The term "contact insecticide" has been used to designate the latter class. It is believed that such insecticides produce their fatal effect, not by penetration of the hard chitinous covering of the insect, but by plugging the tracheae, or breathing pores, so that the insect is deprived of air and suffocated. Some interesting experiments lately made at the Michigan Agricultural College tend to show that the toxic effects of such vapours as kerosene, creolin, and Pyrethrum result from the depression, or arrest, of oxygen-absorption by the tissues.

The presence of some typical insect pests in the plant-houses and vicinity of the College during the past summer afforded an opportunity of comparing the value of some well-known preparations, while attempts were also made to try the insecticidal effects of other substances, such as formalin.

The plants experimented with, and their respective pests, were as follows:—

Green-fly on *Choisya ternata*, *Euonymus japonicus*, *Solanum Dulcamara.*

Mealy bug on *Streptocarpus sp.*, *Coleus sp.*, Cinerarias.

Black-fly on Chrysanthemums.

Woodlice on *Ampelopsis Veitchii.*

Several plants of each kind were sprayed, or "dipped," according to the size, and it was found that considerable differences of resistance to the same strength of solution were exhibited by different plants. *Choisya*, and *Euonymus* stood severe strengths without injury, while the Cinerarias were remarkably susceptible to weak solutions. The others were intermediate in resistance, and each had its optimum strength of insecticide. Such facts as these render spraying with insecticides rather risky for the gardener who has to use the same spray for a mixed collection of plants. The results of the principal experiments are given below.

Quassia.—Quassia chips have long been known as an excellent specific for most pests, and for soft-bodied insects, such as aphides, in particular. I tried various strengths of quassia, and can fully endorse the favourable reputation this substance has achieved. Combined with soft soap or liver of sulphur, or with both, an excellent wash resulted

in every case for green-fly. As might be expected, the delicate plants required weaker solutions, and subsequent spraying with clean water mitigated the action.

Soft Soap and Tobacco, in the proportion of a pound and a half-pound, respectively, to a gallon of water, was a good remedy for mealy bug and green-fly on the plants mentioned. A little turpentine and the addition of a pound of sulphur improved the wash for the *Euonymus* and *Solanum*, but the Cinerarias were badly "burnt." A succession of dilutions showed the caustic action not to decrease until the strength of the constituents was reduced by one-fourth. A proprietary preparation, consisting mostly of soft soap and tobacco, also proved excellent for mealy bug and aphides.

Formaldehyde.—Series of experiments were tried with different strengths of formaldehyde, alone and in combination with other substances. The solutions were made with Schering's formalin, the active principle of which is formaldehyde, stated to be present in the proportion of 40 per cent. Commercial formalin may be safely taken to contain a less amount (average 35 per cent.). Since formalin is one of the strongest antiseptics and fungicides known, it might reasonably be expected that it would have insecticidal properties also, particularly as it gives off the acrid vapour of formaldehyde in air. To test these effects on the plants mentioned, solutions varying in strength from ·01 per cent. to 2 per cent. were used.* It was observed that the toxic effect of formaldehyde above ·5 per cent. was marked on *Ampelopsis*, *Streptocarpus*, and *Coleus*. *Choisya*, *Euonymus*, and *Solanum* were sprayed with a 2 per cent. solution without injury, and were completely cleared of green-fly, which did not reappear for the summer.

The *Ampelopsis Veitchii* was infested with hordes of woodlice, which had their nests about its roots. On pouring some 2 per cent. formaldehyde on the earth near the roots, woodlice poured out in all directions, and were speedily overcome by the fumes. A spray of ·5 per cent. strength killed those which took shelter under the leaves; stronger solutions had a deleterious action on the young shoots and leaves. Traps of apple boiled in mercuric chloride solution were placed about the roots, but practically no woodlice were snared, showing that they had migrated or had been killed.

An attempt was made to lessen the action of the formaldehyde by adding soft soap. Here one would expect the strength of the formalin to be reduced by the organic matter in the resin soap. A slight turbidity was produced on mixing, but the chemical changes which might have been involved were not investigated. A typical wash was composed of ·5 per cent. formaldehyde (1 gallon) and soft soap (½ lb.). This injured the herbaceous plants almost as much as the formalde-

* All these percentages refer to percentages of *formaldehyde*. It is easy to calculate the actual amount of formaldehyde present in formalin spray, as 2·5 parts of Schering's formalin in 100 parts of water give a strength of 1 per cent. formaldehyde.

hyde alone, and no particular strength could be found which killed the insects without injuring the plants. Sprayings of copper sulphate and ferrous sulphate were also tried alone and combined with formalin, but in no case could they be said to equal the old-established sprays in efficacy.

[*Ampelopsis*, *Choisya*, *Euonymus*, and *Solanum* grew in the open; the other plants in the plant-houses, the average temperature of which was 62°.]

ON THE NOMENCLATURE OF THE ORGANISM CAUSING "CORKY-" OR "POWDERY-SCAB" IN THE POTATO TUBER, *SPONGOSPORA SUBTERRANEA* (WALLR.) JOHNSON.

By George H. Pethybridge, Ph.D., B.Sc., F.R.H.S.

To a recent number of this Journal * a useful summary of our knowledge concerning two diseases of the potato—the Wart Disease or Black Scab and the disease caused by *Spongospora*—was contributed by Mr. A. S. Horne, who refers to them under the names of Potato Tumour and Potato Canker respectively.

An extensive bibliography is appended to the article which, however, at least as far as *Spongospora* is concerned, is not quite complete, and for this reason, if for no other, the critical remarks offered with regard to the specific name of this organism cannot be accepted without demur.

Since Massee† has also fallen into error as regards the correct name of this organism, it is necessary that any misunderstandings as to its nomenclature should be cleared up, so that only the correct name may be used in future.

The history of the investigations on *Spongospora* is as follows:—

Although doubtless the trouble caused by the organism had been known previously (probably for some considerable time, seeing that it had already obtained a trivial name, *Kartoffelräude*, among farmers in Germany), the attention of scientific men was first called to it in the year 1841 by Wallroth, who sent specimens of affected tubers and a communication describing the disease and its cause to a meeting of savants held at Brunswick in September of that year. Since Wallroth himself was not present at the meeting, his communication was read by Prof. Bartling, president of the botanical section.

The official report of the meeting ‡ was published during the following year (1842) and contains the description (in Latin) above referred to. The organism associated with the disease was described under the name of *Erysibe subterranea v. Tuberum Solani tuberosi*, and as having very large, roundish, faintly cellular spores, at first yellowish, then becoming brownish-green; situated beneath the outer skin of the tubers while they are still growing underground, the skin exhibiting discoloured areas; then with small swellings becoming roughly slit, disclosing more or less round, hemispherical, many-spored masses, and when these become dissipated, leaving bare scabs on the surface.

* *Journ. R.H.S.* vol. xxxvii. 1911, p. 362.

† *Diseases of Cultivated Plants and Trees*, London, 1910, p. 528.

‡ *Amtlicher Bericht über die neunzehnte Versammlung deutscher Naturforscher und Aerzte zu Braunschweig im September* 1841, Braunschweig, Vieweg und Sohn, 1842.

Another report of the meeting was published in the February and March numbers of *Flora* for 1842, where the following sentence occurs in connexion with the discussion on WALLROTH's communication: "Prof. BARTLING verwahrte WALLROTH's Priorität und wollte ferneren Untersuchungen seine erste Anregung immer zum Grunde gelegt wissen."

Two other descriptions were also published by WALLROTH in the same year (1842). One, dated Nordhausen, February 15, appeared in *Linnaea* * and contains a description in Latin which is almost identical with that published in the official report already referred to.

The other appeared in a publication † the preface of which is dated Nordhausen, March 1842, and the Latin description ‡ given here is somewhat more extended than in the two previously mentioned papers. Here the organism is called *Erysibe subterranea* Wallr., and is described as having very large, roundish, faintly cellular pseudo-spores, at first between the cells, yellowish, concealed beneath the outer skin of the tubers whilst growing under ground, the skin exhibiting discoloured areas; then becoming free by eruption, exposing beneath the warty and raggedly slit skin a slightly convex, powdery, rounded mass: producing small, roundish-oval, hemispherical, shield-shaped pimples, with well-defined contours scattered singly [over the surface of the tuber] or tending to congregate together [on one portion of it], and, when these have become dissipated, leaving small depressions exposed on the surface which are, as it were, surrounded by a clear-cut margin of skin. Accompanying the description is a plate containing four figures, the spore-balls (pseudo-spores) being drawn magnified two hundred times.

In the same year (1842) the organism was described by MARTIUS § under the name of *Protomyces tuberum solani.* He states, "Herr Hofr. Dr. WALLROTH in Nordhausen hat denselben *Protomyces* bei der Versammlung der Naturforscher und Aerzte zu Braunschweig bereits zuerst und zwar unter den Namen *Erysibe subterranea*, tuberum Solani tuberosi, bekannt gemacht (*Regensb. botan. Zeit.* 1842, S. 119), und ausführlich in einer Abhandlung beschrieben. Letztere war er so gefällig mir ebenfalls zur Einsicht mitzutheilen, und ich erkannte daraus mit Vergnügung, dass ich mit diesem ausgezeichneten Kryptogamenkenner über die Natur und Entwicklung des Pilzes vollkommen übereinstimme."

MARTIUS's description is accompanied by figures of the spore-balls, both free and in the affected tissues of the potato.

In the same year MARTIUS also dealt with this disease in a memoir presented to the Academy of Sciences in Paris, || but I have been

* *Linnaea*, Bd. 16, 1842, p. 332.

† WALLROTH, *Die Naturgeschichte der* Erysibe subterranea; WALLR. *Beiträge zur Botanik*, Bd. 1, Heft 1, p. 118, Leipzig 1842.

‡ I desire to express to Professor J. I. BEARE, F.T.C.D., of Dublin University, my hearty thanks for his cordial co-operation in enabling me to discern the exact significance of the terms employed in these Latin descriptions.

§ MARTIUS, *Die Kartoffel-Epidemie der letzten Jahre*, München, 1842, p. 27.

|| *Compt. rend. Acad. Sc. Paris*, 15, No. 7, 1842, p. 314.

unable to find this memoir amongst those published by the Academy, and possibly it was not printed.

RABENHORST * described the disease in 1843, and concluded that the organism could not be regarded as a species of *Erysibe*, but approached in character rather WALLROTH's genus, *Physoderma*. He considered it deserving of the rank of a new genus, to which he gave the name of *Rhizosporium*; and in the first volume of his *Deutschlands Kryptogamen-Flora*, published in 1844, he describes it under the name of *Rhizosporium Solani*. It would also appear that LINK was acquainted with the organism, but I have been unable to obtain his paper published in *Verband d. Vereins z. Beförderung d. Gartenb. in d. K. Preuss. Staaten*, Bd. 16, Heft 2, p. 368.

The disease was also clearly described and figured in 1846 by FOCKE,† who, however, does not mention the previous work of WALLROTH or MARTIUS. He apparently was unable to make up his mind as to whether the spore-balls were the products of a parasitic fungus, or whether they were resinous secretions in the cells of the potato, and consequently no name was suggested for them.

Near the end of his important (and by Continental writers not infrequently overlooked) paper dealing with the Potato Blight (*Phytophthora infestans*), written towards the close of the year 1845 and published in 1846, BERKELEY ‡ devotes a few lines to this organism, and gives figures of the spore-balls. It is clear that BERKELEY had no doubt that the organism he was dealing with was identical with that described by MARTIUS, but he considered that it should find a place in the genus *Tuburcinia* Fr. rather than under *Protomyces*. After shortly describing the spore-balls, however, he explicitly states that "this view of their structure requires more attention than I am able to give it at present." It may be mentioned that BERKELEY did not in this place give the organism any specific name, the full name *Tuburcinia scabies* Berk. being first published in 1850.§

In 1856 a careful and well-illustrated account of the disease was published by VON MERCKLIN,‖ who, like FOCKE, hesitated to consider the spore-balls as of fungoid origin, and thought that they probably consisted of the precipitated, slimy, nitrogenous contents of the cells of the warts. This observer was also apparently quite unaware of the previous work of WALLROTH, MARTIUS, and BERKELEY, and, not regarding the spore-balls as the products of a fungus, did not of course suggest any name for them.

For a considerable period BERKELEY's name of *Tuburcinia scabies* was the one accepted for this organism by British mycological writers.

* RABENHORST, "Ueber die Knollenkrankheit der Kartoffeln," *Arch. d. Pharm.* 83, 1843, p. 300.

† FOCKE, *Die Krankheit der Kartoffeln im Jahre* 1845, Bremen 1846, p. 32.

‡ BERKELEY, "Observations, Botanical and Physiological, on the Potato Murrain," *Journ. Hort. Soc.* vol. i. 1846, p. 33.

§ *Ann. and Mag. Nat. Hist.* vol. v. second series, 1850, p. 464.

‖ VON MERCKLIN, "Nachträgliche Bemerkungen zur Kartoffelkrankheit," *Bull. Soc. Nat. Moscow*, 29, part 2, 1856, p. 301.

and we find it adopted by BERKELEY* himself, by COOKE, †, ‡ by SMITH, § and by PLOWRIGHT. || The last named gives a list of the older synonyms of the organism, but there is a misprint in the date given for WALLROTH's paper, and PLOWRIGHT, like all writers who have dealt with the organism since WALLROTH's time, with the exception of RABENHORST and MARTIUS, overlooked entirely the most important early description of the organism published in WALLROTH's *Beiträge zur Botanik*, and already referred to.

In 1877 FISCHER DE WALDHEIM¶ transferred the organism to another genus, and re-named it *Sorosporium scabies* Berk., and this combination was adopted by various subsequent authors such as SACCARDO,** MASSEE††, ‡‡ and COOKE. §§

In 1886 the organism was discovered anew in Scandinavia by BRUNCHORST, |||| who, not being aware of the previous descriptions by BERKELEY, MARTIUS, and WALLROTH, described it under the name of *Spongospora Solani*, nov. gen. et sp., considering it as belonging to the Myxomycetes. Under this name it is referred to by FRANK in 1897 in his *Kampfbuch*, ¶¶ and by LINDAU*** in 1908 in SORAUER's *Handbuch*. JOHNSON met with the organism for the first time in Ireland in 1904 and published a short account of it three years later, ††† adopting BRUNCHORST's name, while the same author gave another account of it, still adhering to the name of *Spongospora Solani*, Brunch., in 1908, ‡‡‡ but stating at the end of his paper that the examination of type-herbarium material which he had received from Kew showed that *Sorosporium scabies* (Berk.) Fischer de Waldheim was identical with *Spongospora Solani* Brunch.

Later in this year MASSEE§§§ described the organism under the name of *Spongospora scabies*, thus combining BRUNCHORST's generic and BERKELEY's specific names, a combination which was not necessary and is untenable.

Up to this latter year (1908), however, all of the four last-named

* BERKELEY, *Outlines of British Fungology*, 1860, p. 336.

† COOKE, *Microscopic Fungi*, 1865, p. 212.

‡ COOKE, *Handbook of British Fungi*, vol. ii. 1871, p. 516.

§ SMITH, *Diseases of Field and Garden Crops*, 1884, p. 35.

|| PLOWRIGHT, *A Monograph of the British Uredineae and Ustilagineae*, 1889 p. 294.

¶ FISCHER VON WALDHEIM, *Apercu Syst. Ustil.* 1877, p. 33.

** SACCARDO, *Sylloge Fungorum*, vol. vii. p. 513.

†† MASSEE, *British Fungi, Phycomycetes and Ustilagineae*, 1891, p. 202.

‡‡ MASSEE, *A Text-Book of Plant Diseases*, 1899, pp. 225 and 405.

§§ COOKE, *Fungoid Pests of Cultivated Plants*, 1906, p. 92.

|||| BRUNCHORST, "Ueber eine sehr verbreitete Krankheit der Kartoffelknollen.' *Bergens Museums Aarsberetning*, 1886, p. 219.

¶¶ FRANK, *Kampfbuch gegen die Schädlinge unserer Feldfruchte*, Berlin, 1897.

*** LINDAU, *Handbuch der Pflanzenkrankheiten*, von Prof. Dr. PAUL SORAUER, Bd. II, 1908, p. 76.

††† JOHNSON, "Der Kartoffelschorf *Spongospora Solani* Brunch." *Jahresber. d. Verein. d. Vert. d. angew. Botanik*, Bd. 4, 1907.

‡‡‡ JOHNSON, "*Spongospora Solani* Brunch. (Corky Scab)," *Econ. Proc. Roy. Dub. Soc.* 1, 1908, part 12.

§§§ [MASSEE], "'*Corky Scab' of Potatoes* (Spongospora scabies, Mass.)," *Journ. Bd. Agric.* vol. xv. No. 8, November 1908, p. 592.

authors appear to have been unaware of a note on *Spongospora* published in 1892 by DE LAGERHEIM.*

In calling attention to the presence of the parasite in Quito, South America, DE LAGERHEIM states that he believes that BRUNCHORST'S *Spongospora Solani* is identical with WALLROTH'S *Erysibe subterranea*, but as he had not access to the publications of WALLROTH, MARTIUS, and BERKELEY, he was not able to decide the question with certainty. If, however, his supposition were correct, he points out that the fungus should be called *Spongospora subterranea* Wallr.

The same idea had meanwhile occurred apparently independently to JOHNSON,† who in 1909, after reviewing most of the literature of the subject, adopts the undoubtedly correct name of *Spongospora subterranea* Wallr. for the organism; and this name has been used by some subsequent authors, including OSBORN ‡ and the present writer,§ but not by MASSEE or HORNE.

HORNE in the paper in this JOURNAL referred to at the outset maintains that it is desirable to retain BRUNCHORST'S name, *Spongospora Solani* for the organism on the grounds that, firstly, it is not certain that the organism described by WALLROTH, MARTIUS, and BERKELEY was really *Spongospora*, and, secondly, even if that were so, there is some difficulty in deciding whether WALLROTH or MARTIUS (who published in the same year) holds priority.

There is, however, in reality no such difficulty, for, as has already been pointed out, BARTLING distinctly lays down the priority of WALLROTH in the matter, and, further, MARTIUS himself definitely states that WALLROTH had already fully described the organism, and he even quotes a word (*pseudosporis*) taken from WALLROTH'S description || as equivalent to his own word *globulis*. Curiously enough, HORNE himself at one point in his paper appears to admit the priority of WALLROTH when he says "An earlier record of WALLROTH'S *Erysibe subterranea* occurs in *Versam. Deut. Nat. und Aerzte Braunschweig* 1838-1841." The dates given refer however to the years in which the Versammlungen were held, that at Brunswick being in 1841, but the report of it was not published until the following year 1842, and this date HORNE quotes correctly in his bibliography. It is quite clear that WALLROTH was the first to describe the organism, and that MARTIUS was acquainted with at least two of the three descriptions due to WALLROTH before he published his own, for in addition to quoting one word from WALLROTH'S account in the *Beiträge* he also cites the description in *Regensb. Bot. Zeit.* [*Flora*] 1842.

With regard to the first point, I do not agree that the descriptions

* DE LAGERHEIM, "Remarks on the Fungus of a Potato Scab (*Spongospora Solani* Brunch.)," *Journal of Mycology*, vol. vii. No. 2, March 1892, p. 103.

† JOHNSON, *Further Observations on Powdery Potato Scab,* Spongospora subterranea *Wallr.*

‡ OSBORN, *Annals of Botany*, vol. xxv. pp. 271 and 327.

§ PETHYBRIDGE, *Journ. Dep. Agric. and Tech. Inst. Ireland*, vol. x. 1910, p. 254, vol. xi. 1911, p. 441, vol. xii. 1912, p. 351.

|| JOHNSON ("*Further Observations, etc.*" p. 169) is in error in supposing that MARTIUS incorrectly quoted WALLROTH. The word *pseudosporis* is correctly taken from WALLROTH'S paper in the *Beiträge*.

of the organism given by WALLROTH and MARTIUS which HORNE cites are insufficient to establish the identity of the organism with which they were dealing, but in any case had HORNE been acquainted with WALLROTH's description and figures in the *Beiträge* he could scarcely have come to any other conclusion than that the organism we now call *Spongospora* was indeed being dealt with. It may be pointed out, perhaps, that the question of identity does not rest merely upon the degree of accuracy with which the spore-balls are figured, but some regard must also be paid to the very full description given by WALLROTH of the development and fate of the warts, which agrees fully with what we know of the behaviour of *Spongospora*, and which does not apply to any other organism known at present. It is extremely difficult to concur in HORNE's remarks on MARTIUS's figures; to me at any rate it is impossible to interpret them as applying to any organism other than *Spongospora*, and we have it on MARTIUS's own authority that his organism was identical with that described by WALLROTH.

BERKELEY's figures are distinctly poor and not quite accurate (he admits, as has been pointed out, that he had not properly studied the organism), and his specific description published in 1850 is meagre; but JOHNSON's demonstration of the identity of the organism in BERKELEY's type specimen with the modern *Spongospora* renders critical remarks rather superfluous. It is, I think, extremely unlikely that BERKELEY could have confused the spore-balls of *Spongospora* with such structures as the "cell-balls" figured by HORNE.

HORNE says "It seems more desirable to retain the name *Spongospora Solani* given to the parasite by Brunchorst than to adopt first this and [then] that name, as each probing of the older literature of the subject brings to light some new fact."

Few workers, however, who accept priority as the basis of nomenclature, will feel themselves able to concede this point, and it may not be inappropriate at this juncture to quote the following from Article 50 of the "International Rules of Botanical Nomenclature":—"No one is authorised to reject, change, or modify a name (or combination of names) because it is badly chosen, or disagreeable, *or another is preferable* * or better known, or because . . ."

Unless, therefore, further probing of the literature between 1842 and 1753 should show (which I think is *most* unlikely) that this organism had already been described and named, the specific name of it *must* (in accordance with the International Rules) be that of its original describer WALLROTH—namely, *subterranea*.

MASSEE,† who adopts the name *Spongospora scabies* for the organism, states: "Some people profess to trace the name back with certainty to much older authors [than BERKELEY] on the strength of retrospective synonymy, but BERKELEY's description and figure is the oldest that enables anyone to be certain as to the fungus he had in view." I have already pointed out (and in this respect am in agreement

* The italics are the present writer's.

† MASSEE, *Diseases of Cultivated Plants and Trees*, London, 1910, p. 528.

with HORNE) that BERKELEY's figure is somewhat incorrect, and that his description is meagre; and further that the identity of BERKELEY's organism with the modern *Spongospora* rests on the results of JOHNSON's microscopical examination of BERKELEY's type material much more securely than upon the latter's description and figure. I think everyone who has seen them will agree that the figure and descriptions published by MARTIUS and by WALLROTH lend themselves with a far greater degree of certainty to the identification of the organism than is the case with those of BERKELEY, and it seems clear that MASSEE cannot have been well acquainted with them.

Finally, a word as to the trivial name for this disease. In my opinion as much care should be taken to avoid multiplying trivial names for diseases as should be devoted to ascertaining the strict scientific names of the parasites causing them. The trivial names are presumably for the use of the gardener and farmer (and on non-state occasions for the less pedantic pathologists!), and it is rather a hardship to inflict on them a long list of names for one and the same disease. "Corky-End," "Corky-Scab," and "Powdery-Scab" are names which have already been given to this particular disease, and HORNE now adds another one—viz. "Potato-canker"—although, as he himself points out, this is one of the names under which the Wart Disease is also known. The onus of having invented the name potato-canker is thrown on the present writer's shoulders, but although I was perhaps the first to point out that not infrequently the scabs produced by the organism were so extensive that they merited the term canker rather than scab, I had no intention whatever of suggesting another trivial name for the disease. The spot or simple scab form of the disease is, in my experience, far more common than the canker form, and the term potato-canker for this form of it is, in my opinion, most inappropriate. In the case of many of the really deeply cankered tubers which I have examined, *Spongospora* has been associated with other organisms, both animal and vegetable, and it has yet to be determined to what extent, if any, the decay of the tissues of the tubers is due to these other organisms. Hence I consider the addition of the further trivial name, potato-canker, for this disease to be quite unnecessary.

BI-GENERIC HYBRIDS BETWEEN *COOPERIA* AND *ZEPHYRANTHES* PRODUCED AT THE AGRICULTURAL AND HORTICULTURAL SOCIETY'S GARDENS, ALIPORE, CALCUTTA.

By S. Percy Lancaster, F.R.H.S.

In June 1903, my father, the late Mr. Percy Lancaster, obtained a few hybrids between the genera *Cooperia* and *Zephyranthes*, and I cannot do better than quote his description of the three varieties produced. Unfortunately these plants have been lost sight of, and I have been unable to find any trace of them. He used the name *Coo-zephyr* to denote the hybrid origin, but the word *Cooperanthes* is more euphonious, so I adopt it.

> *rosea* (*Cooperia Drummondi* ♀ × *Zephyranthes carinata* ♂).—A strong-growing plant; flower scape 12 inches high; flower larger than *Z. robusta*, pale-green centre, pale pinky-purple above, going off into deeper colour at the edges.
>
> *Lancastrae* (*Cooperia Oberwetti* ♀ × *Zephyranthes robusta* ♂).—Similar to the above but much more robust, with stout flower-stalks; ovary brownish-green, centre of flower apple-green, yellowish-white above, going off into pinkish lilac; flower larger than above.
>
> *Sunset* (*Cooperia Drummondi* ♀ × *Zephyranthes Andersonii* ♂).—This flower is a small-sized *Cooperia*; inside copper and yellow; habit of *Cooperia*.

After my father's death in 1904 I found these notes in his bulb-note book, and as I could not discover the plants mentioned, commenced hybridizing on my own account. In June 1907 I got two new varieties from my first batch of hybrids.

> *bella* (*Cooperia Drummondi* ♀ × *Zephyranthes robusta* ♂).—A strong grower; flower-stalk like *Z. robusta* on emerging above ground, dull green; flower-bud white, tinged pink at apex and edges of petals; colour soft rose, outside of petals deeper pink. The flower opens late in the afternoon and is faintly scented like *Cooperia*.
>
> *blanda* (*Cooperia Oberwetti* ♀ × *Zephyranthes Tretiae* ♂).—A small flower, white, flushed pinky-purple, base apple-green; flower-stalk green, reddish base. The flower closes early the first day, but opens a second day; seed capsule like *Cooperia*.

Owing to force of circumstances I was separated from my work for a few years, and on my return discovered that my seedlings and hybrids had been lost. Nothing daunted I started my experiments

once more, and up to the present time have obtained the following hybrids:

Alipore Beauty (*Cooperia Oberwetti* ♀ × *Zephyranthes robusta* ♂).—In foliage like *Zephyranthes robusta*, ¼ inch wide; with a faint suspicion of bloom on the foliage; flower-stalk 12 inches long, base brownish-green; flower the size of *Z. robusta*, soft lilac-rose overlaid with white from base upwards; back of petals deeper pink; long petals; pistil suppressed; flower upright like *Cooperia*; perianth tube 3 inches long.

Percy (*Zephyranthes citrina* ♀ × *Cooperia Drummondi* ♂).—Foliage like *Cooperia*, ⅛ inch wide, with a faint tinge of bloom; flower-stalk 8 inches, base pale red; perianth tube short, pale green; ovary green; pistil suppressed; colour of flower pale cream, centre slightly deeper; flower nodding like *Zephyranthes*.

Mary (*Cooperia Drummondi* ♀ × *Zephyranthes robusta* ♂)—In foliage like *Cooperia Drummondi*, covered with a heavy bloom, ¼ inch wide; flower-stalk 8 inches high, base brownish-green; the flower is the size of *Cooperia Drummondi*, only a delicate flesh-pink; perianth tube 2½ inches long; pistil suppressed; flower upright like *Cooperia*.

Sydney (*Cooperia Drummondi* ♀ × *Zephyranthes citrina* ♂).—In foliage like *Cooperia Drummondi*, covered with a heavy bloom, ¼ inch wide; flower-stalk 8 inches, green, base reddish; flower like *C. Drummondi*, pale sulphur in colour, fading to a creamy white in the sun, but keeping open for a second day; flower upright like *Cooperia*; perianth tube 3½ inches long.

In the *Cooperanthes* hybrids (*Cooperia* ♀ × *Zephyranthes* ♂) the former is dominant over the latter in foliage and shape of flower, but the colour in every case is modified. In *Zephyranthes* ♀ × *Cooperia* ♂, the former is dominant in colour and shape of flower.

I have noted below the chief distinctions between *Cooperia* and *Zephyranthes*.

Cooperia Drummondi has primrose-scented flowers, perfectly upright in growth, white in colour, which open in the afternoon; the foliage is ¼ inch to ½ inch wide, covered with a whitish bloom. The anthers are pressed close round the style below the stigma, which is large. The perianth tube is 3 inches long. In *C. Oberwetti* the foliage is narrower than *C. Drummondi*, and has less bloom.

Zephyranthes has the funnel-shaped flowers and flower-tube short, and nodding stamens affixed to the throat of the flower. The stigma is distinctly three-branched. The flowers of *Zephyranthes* are of various colours, and the foliage of different widths from $\frac{1}{16}$ inch to ¼ inch.

I have still a few hundreds of hybrid progeny, which will in all probability flower in June 1912, and I expect a good many more *Cooperanthes*.

THE WEATHER OF THE HORTICULTURAL YEAR 1911-12.

By R. H. Curtis, Hon.F.R.H.S.

With the advent of October one may consider the horticultural and agricultural year to have come to an end, and it therefore seems an appropriate point at which one may take a brief general survey of the weather conditions which have prevailed throughout the technical year, in anticipation of the more detailed account which it is usual to give with the report on the observations made at Wisley during the calendar year.

Going back, then, for twelve months, we find that October 1911, the opening month of the technical year, began with fairly warm and sunny weather, which, however, gradually became unsettled as the month progressed, causing a somewhat heavy rainfall over the south-eastern counties of England, although elsewhere the total precipitation for the month did not differ greatly from the average amount. The two following months were both windy and wet, but not cold, and although in places there was an abnormal amount of rain, particularly during December, yet generally speaking there was an average amount of sunshine; frosts were infrequent and not severe, and there was less than the usual amount of snow.

January of 1912 opened with warm weather for the time of year, but this was soon followed by sharp frosts, during the continuance of which some very low night temperatures were recorded by thermometers freely exposed to radiation by being laid upon the ground, and especially was this the case towards the close of the month. Except in the north and west of Scotland, and the north of Ireland, the rainfall was again heavy, and in some districts this resulted in floods, which in the Thames Valley and in portions of Sussex and elsewhere were very severe, and the cause of much damage and loss to farmers and others. In February the rainfall was generally less than the average, but it was still excessive over the southern counties of England and also in Ireland. Some very low temperatures were, however, observed during the opening days of the month in nearly every part of the kingdom, the thermometer in some northern districts falling very low indeed; but the cold spell did not last very long, and throughout the greater part of the month the weather was boisterous and unusually mild, the average temperature for the month being above the normal. March was another warm month, particularly over the southern half of England; but this high average was due less to warm days than to warm nights, the fact being that the days were less warm than usual, whilst the nights were warmer, both resulting from the prevalent cloudiness which not only intercepted much of the solar radiation by day, but also prevented loss of heat by terrestrial radiation at night.

Up to this point—the close of the first half of the technical year—the fall of rain had been unusually abundant all over the British Isles, and in some parts it had already amounted to, or closely approximated to, the fall usually recorded in twelve months. In the west of Scotland this wetness continued throughout April, but elsewhere April was an extremely dry month, certainly the driest April, and with only one or two exceptions the driest month, on record since rainfall has been satisfactorily measured and recorded. At Wisley the fall only amounted to two-hundredths of an inch, and this amount fell on the first day; but over the whole of England, with the exception of the extreme north-west, and over the eastern counties of Scotland the fall was less than half an inch, and only in those parts of the Kingdom which are usually the wettest did it amount to so much as an inch. The month was also warmer than the average, and very sunny, but there were several sharp ground-frosts, and at Wisley the thermometer, exposed on the grass, once fell to 17° below freezing-point, and on two other occasions to 16° and 15° below freezing—very dangerous temperatures when vegetation is growing quickly under the influence of more than usual warmth and sunshine during the day.

In many districts the fall of rain continued to be below the average during May, but not to nearly the same degree as in April. But the temperature was again above the average (for the thirteenth month in succession at Wisley), although the amount of sunshine was smaller than is usual in May; but as was the case in March, the screen of cloud which cut off the sun's heat from the earth by day conserved the heat of the ground by night, and the high mean temperature was thus due to the high minima, and not to unusually high maxima. June, the midsummer month, was far from maintaining its usual character. In most parts of the country there was a large deficiency of sunshine, but everywhere there was again a large excess of rain, and in some places it fell nearly every day; thunder-storms, with destructive falls of hail, also visited some districts, and in Shropshire it was reported that on one occasion "heavy snow" fell with the hail. With July there came some improvement in the weather, although the month did not entirely maintain its character as a summer month; but in the first half of it there were some really hot spells, with an occasional cool day or two interspersed, and temperatures as high as 90° were recorded in South-east England, and upwards of 80° over most of the southern half of England. The latter half of the month was unsettled, and the cool spells became more frequent. The general result was a total of sunshine less than the average, and a fall of rain somewhat in excess of the average, over most parts of the country, and more than double the average here and there. August was an altogether unseasonable month both as regards temperature and rainfall, the former being phenomenally low and the latter largely in excess over nearly every part of the kingdom. The amount of sunshine was also very small, and in many districts it only amounted to about one-third of the normal amount, the combined result of the

cloudy skies and cold winds being that the maximum temperature did not in most places exceed 65°, whilst the minimum fell perilously near to freezing-point, and the mean temperature was the lowest experienced in any August during the last four decades at least. The fall of rain over the southern half of the kingdom was about double the average, and in some districts considerably more, and it was only in the west of Scotland and the west of Ireland, usually the wettest districts, that the fall did not reach the average. But the outstanding episode of the month was the deluge of rain which descended upon East Anglia near its close, when nearly seven and a half inches fell at Norwich, which was the centre of the area involved, between 4 A.M. on the 25th and 4 A.M. on the 26th, and the whole of North-east Norfolk was swept by a devastating flood. It has been estimated that the quantity of water deposited upon the county during the storm equalled twice the contents of Windermere, with the result that the outstanding crops were carried away, bridges were destroyed, and other structural damage done, and whole districts isolated for several days. The weather of September was an improvement upon that of August, but again there was a great deficiency of warmth, although over the country generally there was an almost entire absence of rainfall throughout the greater part of the month. There were some very low temperatures during the latter half of the month, and some sharp ground-frosts (24° at Wisley) in the closing week. The mean temperature was therefore again below the average; but owing to some exceptionally heavy falls of rain which occurred on the last two days, the total rainfall was, in spite of the spell of drought, generally up to, and in some cases in excess of, the average.

This synopsis of the weather of the technical year under review shows that it cannot be described as ideal from the farmer's or the horticulturist's point of view. The excessive wet of the opening months retarded the preparation of land where that had been delayed beyond October, but with that exception there was but little of which to complain during the first half of the period, and the drought with which the second half opened was less serious than it might have been, owing to the quantity of moisture in the ground; but the excessive wetness of the following months, combined as it was with a phenomenally low temperature throughout till the end of September, resulted in damage to growing crops, and in making it in some localities impossible to gather them in satisfactorily.

COMPARATIVE NOTES ON THE SPRINGS AND SUMMERS OF 1911 AND 1912.

By T. H. Dipnall, F.R.H.S.

The two seasons 1911 and 1912 have been remarkable in many ways, but in none more than in their similarity in some respects, and their complete unlikeness in others. Their likeness in the matter of rainfall was so great till the end of July that I wrote to the Curator of Ipswich Museum, the nearest reliable station, and through his courtesy obtained the figures given below. The configuration of the district in which I live is such that during spring and summer the thunder showers and storms divide in the west before reaching us, part passing seawards, down the river Stour, and the other part travelling to the north, and finally down the Gipping and Orwell past Ipswich to Harwich. This, of course, greatly influences our summer rainfall, and in an ordinary season one might safely say that we get from one to two inches less rain than Ipswich between April and September. These notes cover the period March 24 to September 30, and the average character of each month is as follows: March, cold and rather wet, with a good deal of snow; the worst snowstorm of the winter often occurs in this month; April, very dry and cold, with plenty of east wind and light snow showers; May is a moderately wet month, and usually cold, with sharp frost at night, in the middle of the month; June is usually cold and dry to about the 21st, afterwards hot, with frequent thunderstorms; July has a heavier rainfall than any month except October, but not many wet days; it is usually warm with two or three cold wet days about the 15th; August is hot and dry, with some heavy storms; and September is the driest and finest month of all, and generally has a hot fortnight.

The two seasons 1911 and 1912, however, departed considerably from the normal. In both years the winter months were, on the whole, mild and very wet, 1912 having the milder winter, though sharp frost occurred in the first week in February. In 1911 correspondingly severe weather was delayed till the first week in April, when 12° frost were experienced on three successive nights, and 4° at noon on the 5th, on which day there were heavy snow storms which drifted to a depth of 2 feet where the north-east gale made itself felt. The wet weather in each year ended soon after the spring equinox, and from March 24 onward the conditions were dry. The following table

shows the rainfall (at Ipswich Museum) from March 24 to July 31, with the number of days on which rain fell:—

	1911	1912	Average
March 24–31 .	0·25 (4 days)	0·07 (4 days)	0·35 in.
April . . .	1·28 (13 ,,)	0·28 (7 ,,)	1·51 ,,
May . . .	0·84 (4 ,,)	0·48 (9 ,,)	1·89 ,,
June . . .	2·77 (13 ,,)	2·99 (18 ,,)	1·73 ,,
July . . .	1·55 (7 ,,)	2·22 (13 ,,)	2·34 ,,
Totals .	6·69 (41 days)	6·04 (51 days)	

The average given is for twenty years ending 1887.

I regret that Ipswich figures are the only ones available, because I am quite sure that here the 1912 rainfall for June and July was considerably less than that given, but there is no situation sufficiently open in my garlen to put a gauge with any chance of getting accurate figures. The two notable features of this table are that the spring and early summer were drier this year than last, and that June was in both years the wettest month. The August rainfall was very deficient in 1911, appreciable rain falling between August 1 and September 13 on August 21 and 22 only. This is a great contrast to 1912, the late August having been the wettest on record. Only eight days were rainless; 7·39 inches fell during the month, of which 3·19 inches fell between midnight on the 25th and midnight on the 26th, the eight days 19th to 26th giving altogether 4·89 inches. September had showers or drizzle on eleven days, heavy rain during the night 29th to 30th, amounting to over 2 inches, and bringing the total well above the average. In sunshine and temperature the two seasons afford a contrast, June being the only month in which they were at all alike. The really noteworthy feature of 1911 was not so much the drought—1893 and 1895 were both drier—as the great heat and the abundant sunshine. 1912 has gone from bad to worse in this respect. The spring was, on the whole, sunny and warm, but a thundery type of weather set in after the middle of May, and from then till September the sun was always partially obscured by a very high, thin cirrus haze, with the possible exception of the one hot week in July. August and September were almost the dullest on record. In 1911 temperature was 80° and upwards on twenty-nine days, and 90° or more on five of them. In 1912 it reached 80° on May 11 and June 19, and was above 80° from July 12 to 16, inclusive; the maximum for the summer being 86° on July 13, as against 93° on August 9, 1911. After July 27 the thermometer never reached 70°, August and September being the coldest I ever remember.

With respect to the effect of the two seasons on vegetation, one might say that 1912 has done its best to counteract the benefits conferred by 1911. Perhaps the most noticeable feature of the current season has been the extreme earliness of everything. The hazels were in full bloom at Christmas 1911; snowdrops came at the Epiphany. There is a saying in Suffolk that early snowdrops mean an early harvest, and harvest began quite a fortnight before its usual time. The

daffodils came before the swallow dares with a vengeance, *N. Pseudonarcissus* appearing on February 24. "Palm" was out the first week in Lent instead of the last, cherries were in bloom before the end of March, and apples halfway through April. The birds and butterflies were equally precocious: I heard the cuckoo on April 19, and saw a house-martin on the 20th, and an orange-tip butterfly on the 21st. But this is not so remarkable as the early ripening of the later fruits: plums were a full fortnight before their usual time, and apples and pears, that are usually gathered in October, were dead ripe by the third week of September, in spite of the extreme cold and sunlessness of August and September. The trees and hedges, too, have assumed their autumn tints quite a month before the usual time. A very noteworthy feature of the flowering period of the trees and shrubs was the abundance and size of the blooms, and, spring frosts being practically absent, the fruit crop was, on the whole, good. Strawberries and currants seemed to feel the effects of last year's drought most; there was an enormous crop of gooseberries and pears; apples were a good crop except where they were very heavily laden last year. Cherries promised splendidly, but the spring drought was too much for some varieties. The first crop of roses was early and good, the later blossoms have suffered from the wet. I gathered the last rose of 1911 on February 9 of this year, and the first of 1912 on April 24 off the same bush, an old pink monthly rose. Sweet peas have been unsatisfactory on the whole. The severe frost in February, followed by five weeks' rain, was too much for many of those sown outside in September 1911. The survivors grew well and were in blossom by May 23, but were crippled by greenfly in June, as were those sown in spring. A close, thundery type of weather, such as prevailed from May till August, seems to affect them adversely. In other years I have noticed them get disease and go off rapidly during a spell of similar weather. The same conditions also seem to favour the multiplication of plant lice and the spread of mildew and other fungus diseases.

Perennials have done splendidly this year, evidently using the stored-up energy of 1911. They were absurdly early; I gathered phloxes and outdoor chrysanthemums, which usually do not open till the end of July and August, in June. Annuals have not been such a success; with the exception of asters, the later kinds suffered severely from the cold and wet of the latter part of the summer. Early vegetables, including early potatos, did remarkably well; late potatos are practically a failure, the wet week, August 20-26, caused the disease to spread very rapidly, so that in some cases not a single good tuber is to be found. Turnips, parsnips, carrots, and beet are all good crops, but there is a good deal of diseased celery about.

I have already remarked upon the unusual earliness of everything in spite of the cold and sunless weather this year. Another unexpected feature this season is the lovely colouring of the apples, which must be the aftermath of last year's sunshine, as it is certainly not due to cloudless skies this year. Fruit, too, has more flavour than might be

expected, though I think it extremely doubtful whether it will keep well. It is always unsafe to prophesy, but unless October and November are a great contrast to the preceding two months, I am afraid we may expect poor results next year, both from our fruit-trees and our flowering shrubs.

The last point which I will mention as worthy of notice, though it is frequently observed in autumn after a cold, wet August, is the way in which the spring flowers are blossoming for a second time. Primroses, violets, Arabis, wallflowers, periwinkle, Welsh poppies, and others are out in flower, and will probably go on through the winter unless severe frost sets in.

THE COOKING OF ROOTS AND TUBERS.

By C. Herman Senn, G.C.A.

[Read September 27, 1912; Mr. W. A. Bilney in the Chair.]

Roots and tubers are rich in carbohydrates, containing large quantities of starch, sugar, or inulin, and certain mineral salts as well.

To English people the potato naturally occurs first among this group of vegetables. It is certainly a useful one, and valuable from a dietetic point of view for its starch and mineral salts, especially the latter. Potash salts are the most abundant, as well as the most important, of the mineral matters contained in the potato, and as some of the potash is combined with citric acid, the potato has, in consequence, exceptional value as an anti-scorbutic. Again, potato starch, provided the potatos cook dry and mealy, is most wholesome and easily digested.

Potatos in the past have been cruelly abused in the cooking. English cooks are especially to blame in this particular, most of the goodness of the potato being lost in the processes of preparation and cooking. Crude methods of boiling and baking seem to be the only ones in vogue in most English establishments, notwithstanding the fact that a cookery-book has been published describing three hundred different ways of serving this vegetable. Various kinds of tropical tubers somewhat similar to potatos may now be obtained in the London markets, and these form a welcome relief from the English potato. The *sweet potato*, or Batatas, forms the food of the poorer classes in the United States; it is also used in France and Spain. It contains 16 per cent. starch and 10 per cent. sugar, whence its name. The sweet potato used to be eaten in England before the present potato was widely grown. *Yams*, especially the white yam, approach very nearly to the potato in taste, but are more nutritious. The majority of people who taste them for the first time prefer them to the potato owing to their superior flavour. Both these tropical tubers may be cooked by the same methods as the common potato.

Other equally well-known English root-vegetables are carrots, turnips, and parsnips; but these seem to have fallen somewhat out of favour of recent years, partly owing to their natural insipidity and partly because other root-vegetables are taking their place. These newer kinds will be dealt with later. Much of the insipidity of the above-named roots might be avoided by peeling or scraping them *after* cooking, as we do with beetroots, and by serving them with some borrowed piquant flavouring, such as savoury sauces, mustard, curry powder or paste, herbs, and spices. Carrots have a special food-value owing to the sugar they contain, but they have the disadvantage of being indigestible. Parsnips contain both sugar and

starch, and for this reason beer and spirits are sometimes prepared from them. Turnips, on the other hand, are very poor in nutrition, being nearly all water, with no actual starch; but they possess an excellent flavour, especially when young. Swedes, a variety of turnip, are rather more nutritious, but are too coarse in flavour for popular acceptance amongst any but the lower classes. The turnip is a particularly useful vegetable, as not only the root, but the green shoots above ground, popularly known as turnip-tops, are also eaten.

Beetroots are rich in sugar. There are other varieties besides the common red beetroot seen in this country—*e.g.* the pink beet, the German yellow beet, and the Russian white beet, which is the richest in sugar of them all. It is said that the Greeks had a great liking for the beetroot, and also ate the leaves, baked or cooked like spinach. There are three ways of cooking beetroot—(1) boiling in water, (2) baking in the oven, (3) cooking in hot ashes. It is always better to roast beetroots than to boil them, as, by so doing, less of the delicate flavour is dissipated. The Jerusalem artichoke is another well-known English root, or rather tuber, vegetable. It contains no starch, and for this reason does not cook mealy like potatos. The place of starch is taken by a soluble substance called inulin. It easily becomes discoloured, and consequently needs an acid in the rinsing and cooking water in order to preserve its whiteness. In flavour this artichoke has a marked resemblance to the green or globe artichoke. The onion, homely but wholesome—which is really a bulb, not a root—with its allies of leeks, shallots, chives, and garlic, is perhaps the most valuable of our English "root" vegetables, not only from a dietetic, but from a medicinal point of view. Its strong smell and taste are due to a pungent volatile oil contained in little sacs or cells distributed over the surface. Either boiled or raw, onions are a wonderful remedy for skin diseases. Eaten the last thing at night, they are a certain antidote for sleeplessness and also a gentle aperient. Spring onions are worth their weight in gold so far as their medicinal qualities are concerned, whilst onion-porridge is an old-fashioned but sure remedy for a cold in the head.

A few years ago the roots and tubers we have hitherto been considering, together with a monotonous selection of "greenstuff," formed the sum-total of the greengrocer's stall during the winter months for all but the tables of the wealthy. To-day, however, improved methods of vegetable cultivation and increased trading enterprise have supplemented this meagre list with a number of new root-vegetables, the possessors of strange names, but withal excellent eating. Salsify, for instance, when seen for the first time, might possibly be dismissed as a sort of inferior parsnip, but those who know it are well aware that it is a far rarer vegetable, with a delicious and distinct flavour of its own, resembling oysters. For this reason it is sometimes nicknamed "oyster plant." There are many ways of preparing salsify roots for the table, and they may be stewed, fried in butter, coated in batter, boiled and served in sauce, scalloped, or made into croquettes. The

scorzonera, or Spanish salsify, closely resembles salsify in flavour, but is mostly black in colour. After scraping, however, the flesh will be found perfectly white and of a fine texture. It may be cooked in the same way as salsify. Celeriac, better known as turnip-rooted celery, is another less familiar winter root-vegetable. It is peeled and prepared for table like all other roots, and has a similar flavour to celery. It may be cooked like that vegetable, but is also used raw in salads, seasoned with lemon-juice or mayonnaise sauce. The roots of turnip-rooted chervil may also be prepared after the same fashion, and are floury and sweet in flavour. Stachys, a root-vegetable hailing from Japan, has recently been imported into the London markets, though its use as a vegetable has not spread very much. Its shape is odd, and resembles a little curled root. The flavour of this vegetable is between the Jerusalem artichoke and the globe artichoke. It is easy to cultivate, and its principal merit is that it can be gathered at a time when other vegetables are rare. Chinese artichoke-tubers form another unfamiliar specimen of winter root-vegetables. They are little knotted spiral rootlets, something like miniature cork-screws in appearance, and very much smaller than ordinary Jerusalem artichokes. They are scraped for the table after the same manner as young potatos. Epicures usually prefer them fried, when the flavour is said to be so delicate as to be almost elusive. Attempts are being made to introduce the Kohl-rabi, often called Kale-turnip in this country, as a substitute for the common turnip. This is a curious vegetable, with its round, turnip-like body and short green leaves branching in all directions. It is prepared and cooked in the same way as the ordinary turnip, whilst the stalks also are eaten, and have a cabbage-like flavour. It is solid and more nutritious than any turnip of the same size, besides being hardier and not so readily attacked by fly.

A FEW RECIPES FOR COOKING ROOT VEGETABLES.

Fried Artichoke Chips.

Peel some Jerusalem artichokes, cut them into very thin slices (chips), place them in salted cold water flavoured with lemon juice, for about an hour. Take up, drain, and dry them well, then fry a few at a time in very hot fat. Drain, shake the chips in a basket or napkin, and dredge with fine salt.

Jerusalem Artichokes au Gratin.

Wash, brush, and peel about 1½ lb. Jerusalem artichokes; then slice and cook them in salted water containing a little lemon juice. When drained, range them on a buttered gratin dish with alternate layers of grated cheese and Béchamel sauce. Besprinkle the top with bread-crumbs and grated Parmesan cheese. Place little bits of butter here and there, and bake in a sharp oven long enough to slightly brown the surface.

Carrots with Flageolets.

Trim, wash, and scrape a bunch of young carrots, and cook them in salted water until tender, then drain and toss them in 2 ounces of fresh butter. Put half a pint of cooked flageolet beans into a buttered fire-proof dish; sauce over with Béchamel or other rich white sauce. Upon this range the cooked carrots, neatly glaze them with dissolved meat glaze, besprinkle with chopped parsley, garnish with fleurons of puff pastry, and serve hot.

Carrots à la Vichy.

At Vichy carrots are eaten in large quantities on account of their beneficial properties against liver complaints. They are prepared in different ways, but usually served cooked in the following way: Clean the carrots; if very small leave them whole, but if large cut them in rounds $\frac{1}{3}$ inch thick. Place in a saucepan with a little chicken stock, a piece of butter, season with salt, pepper, and a little castor sugar, add a peeled onion, bouquet garni, and parsley. Mix and let simmer until the juice in which the carrots are cooking is reduced to a glaze. Cook in this way until the carrots are glazed. Dish up and serve very hot.

Turnips à l'Italienne.

Wash a bunch of young turnips, and peel them thinly; if large, cut them in halves; cook them for twenty minutes in salted water. Strain off the water, and drain the turnips. Melt 1 ounce of butter in an earthenware casserole, or, failing this, use a pie-dish; put in the turnips, adding a little white sauce between the layers; season with salt, pepper, and a little grated nutmeg. Sprinkle a small handful of bread-crumbs over the top, also some grated cheese and a little oiled butter. Bake in the oven for about thirty minutes, and send to table on the same dish.

Beetroot Tossed in Butter.

Peel and cut into slices one to two cooked beetroots. Put them in a sauté-pan containing about an ounce of hot butter. Season with salt and pepper, and toss over a quick fire until the beetroot is very hot. At the last add a little chopped parsley. Serve in a vegetable dish and pour over a little hot, well-flavoured brown sauce.

Stewed Parsnips.

Wash, peel, and cut three parsnips into slices, then boil them till they are nearly done, drain them and let them cool. Melt 2 or 3 ounces of bacon fat in a stew-pan; when hot, fry the parsnips to a light brown colour. Next add a tablespoonful of flour, and moisten with sufficient brown stock just to cover the parsnips. Season with salt and pepper and one or two tablespoonfuls of tomato sauce. Bring to the boil, and let the parsnips simmer slowly for another twenty minutes. Dish up and serve with the prepared sauce.

Parsnip Salad.

Plainly-boiled parsnips, when cold, make an excellent salad. Slice the parsnips, not too thinly, and season with salt and pepper, and mix with vinaigrette salad dressing. Dish up and serve.

Braised Spanish Onion.

Wipe and skin two sheep's kidneys, cut them into small pieces, and season with salt. Peel four Spanish onions, scoop out the centre ($1\frac{1}{4}$ inch across), fill with the kidney. Carefully place them in a saucepan, pour over about a pint of brown gravy, and simmer slowly for about two hours. Place on a hot dish, pour over the gravy, and serve hot.

Salsify Fritters.

Wash and scrape a bundle of salsify, place in salted water flavoured with vinegar or lemon juice. Boil the salsify in stock or water. When done, take up, drain them on a cloth, and let cool. Put the pieces in a basin with two tablespoonfuls of oil to one of vinegar. Season with nutmeg; allow them to remain in the seasoning for one hour. Take out, drain, and dip them in frying batter; fry them in hot fat. Drain, and dish up on a folded napkin; garnish with fried parsley, and serve.

ANNUAL REPORT OF THE CONSULTING CHEMIST FOR 1912.

By Dr. J. A. Voelcker, M.A., F.I.C., F.L.S.

In the course of the year 1912 twenty-two samples were submitted by members for analysis. The list of these is as follows:—

Peruvian guano	1
Lime	2
Waters	6
Drainage waters	2
Soils	9
Miscellaneous	2
	22

Peruvian Guano.—A sample of this was sent which had been purchased at £12 15*s.* per ton delivered, under a guarantee of its containing ammonia 11·69 per cent., phosphates 33·05 per cent., and sulphate of potash 2·71 per cent. The results of my analysis showed the material to contain:—

	Per cent.
Ammonia	10·61
Phosphates	31·19
Sulphate of potash	4·48

It will be noticed that, while the manure was 1 per cent. deficient in ammonia and practically 2 per cent. deficient in phosphates, the potash was considerably above the guarantee. The guano was one of high quality, and the price was not out of the way.

Lime.—Two samples of lime were submitted to me, the analyses of which were as follows:—

	No. 1. Per cent.	No. 2. Per cent.
Lime	77·81	86·06
Silica	8·76	3·29
Oxide of iron and alumina	2·69	1·79
Water, magnesia, &c.	10·74	8·86
	100·00	100·00

No. 2 was decidedly the better sample. It was sold as "Ground lime," and was quite finely ground.

Waters.—Under this heading are mentioned merely those points which may be of interest.

(*a*) This was a decidedly soft water, and naturally quite pure, but it was contaminated with lead, owing to the action of the soft water upon the lead pipes which had been used for conveying it.

(*b*) A sample of water was sent to me which had been taken from a pond, the water being led from this in galvanized-iron pipes. The water of the pond was used when the supply of rain-water was short.

A complaint was made of the water from the pond having done injury to plants, the roots appearing to be burnt up. The length of piping was about 600 yards. I made an analysis of the water taken direct from the pond, but without ascertaining anything that would clearly account for the injury. The water contained 20.72 grains to the gallon of total solids, but there was no excess of chlorides, vegetable matter, or other constituents that might be harmful, and the water was not sufficiently hard to do injury on this account.

In another sample sent to me which had been standing in the pipes, I found some amount of reddish suspended matter, this being due doubtless to iron compounds. I suggested a trial being made with the water taken direct from the pond, and it was found that plants watered in this way did perfectly well. I could therefore only account for the fact of the injury done by the water after passing through the pipes, to the action of the water upon the galvanized iron.

(*c*) A sample of water was sent me from a well near Rugby to report upon its suitability for drinking and domestic purposes. This water was found to be extremely hard, containing as much as 98 grains to the gallon of total solids, these consisting mainly of lime and magnesia salts. Such a water is clearly unsuitable for a general domestic supply.

(*d*) A sample of water was sent me for analysis from some nurseries, and together with this were forwarded some vine leaves which had a distinct deposit on their surface. It was desired to know whether there was any connexion between the water and the deposit on the leaves. The water was analysed, with the result that it was found to contain about 45 grains of total solid residue to the gallon. It was not a pure water, but evidently contained drainage products, possibly from heavily manured land. The deposit on the leaves was also examined, but proved to be purely of fungoid nature, and there was no direct connexion between the water and the existence of the deposit on the leaves.

Drainage Waters.—Two samples called "Manure water" were sent to me in order to determine whether they had to do with injury to plants for which they had been used. The drainage waters in question, it appeared, came from the stable-yard, being conveyed by ordinary drain-pipes into a wooden tub, from which they were applied to the plants.

Specimens of pelargonium plants were sent me, the leaves of which had turned completely yellow, the plants looking quite burnt up. It was stated that all plants that had been watered with the drainage matter had been similarly affected.

My examination of the samples showed that they both of them contained large amounts of arsenic in solution, thus accounting for the injury done to the plants. I made further inquiries as to how the presence of the arsenic could be accounted for, and more especially whether possibly a weed-killer had been used on the paths, and so found its way into the yard. No definite information, however, on these points was obtainable.

Soils.

(*a*) *Soil for Apples.*—The following are the analyses of the top-soil and sub-soil of land coming from the Upper Triassic formation in Somersetshire. It was intended to grow apples on this soil:—

Soils dried at 212° F.	Top-soil. Per cent.	Sub-soil. Per cent.
Organic matter and loss on heating	5·23	2·73
Oxide of iron	3·90	5·15
Alumina	4·43	4·70
Lime	2·16	·66
Magnesia	1·03	1·46
Potash	·71	·93
Soda	·31	·20
Phosphoric acid	·10	·09
Sulphuric acid	·25	·29
Insoluble silicates and sand	81·88	83·79
	100·00	100·00
Nitrogen	·198	·114

Speaking generally, the soil was one suitable for apple-growing, except as regards the amount of phosphoric acid, which is distinctly low. It was of good depth and very even throughout, this being also an important consideration in such a case.

(*b*) *Soil for Vine Border.*—Two samples of soil intended for use as a vine border were sent to me for partial analysis. The results were as follows:—

Soils dried at 212° F.	No. 1. Per cent.	No. 2. Per cent.
Organic matter and loss on heating	9·73	5·01
Lime	·33	·49
Phosphoric acid	·16	·13
Alkalis, &c.	1·26	·61
Insoluble siliceous matter	81·56	89·38
Oxide of iron and alumina	6·96	4·38
	100·00	100·00

Neither of these soils could be called good, both being distinctly poor in lime, a necessary constituent for vine-growing. They were also only moderately supplied with phosphoric acid.

(*c*) *Soil for Flowering Shrubs, Herbaceous Plants, &c.*—A sample of soil from the neighbourhood of Woking was sent me in order to ascertain in what respects it might be deficient, the intention being to use it for growing flowering shrubs, herbaceous plants, &c. The analysis was as follows:—

Soil dried at 212° F.	Per cent.
Organic matter and loss on heating	6·46
Oxide of iron	·24
Alumina	·32
Lime	·10
Magnesia	·33
Potash	·08
Soda	·08
Phosphoric acid	·04
Sulphuric acid	·04
Insoluble siliceous matters	92·31
	100·00
Nitrogen	·14

The soil was a black peaty sand of very light character, and the analysis shows it to be of extremely poor character, it being very deficient in the principal elements of fertility—namely, lime, potash, and phosphoric acid. Such a soil as this would, no doubt, be just the kind of one in which to grow Rhododendrons, Azaleas, Ericas, and similar plants which do not need lime, but for shrubs and herbaceous plants generally it would undoubtedly require the addition of lime, and also of materials containing phosphates and potash. Also, it would be very desirable to alter its mechanical and physical properties by incorporating with it clay or soil of heavier character than its own.

Soil Fumigants.—Two samples which had been sold as "soil fumigants" were sent to me for general examination. I found these to be very similar in nature, and they consisted principally of naphthalene with some form of lime. In the one case the lime was present as carbonate of lime, and in the other gas lime appeared to have been used. There was also in one of the samples a small amount of carbolic acid.

BEDDING PELARGONIUMS AT WISLEY, 1912.

Ninety-eight stocks were received for trial, and all were planted out in fairly good soil, in a very sunny position, nearly all making excellent growth, but a few showed little inclination to bloom. The trial proved that there was no advance on some of the older and well-known varieties, 'Paul Crampel' being much the finest scarlet-flowered bedding variety in the whole trial.

F.C.C. = First-class Certificate.
A.M. = Award of Merit.
XXX = Highly Commended.

Tricolor Section.

*1. Mrs. Pollock (Dobbie), **F.C.C.** August 21, 1867.—A very effective variety of nice bushy habit with large leaves, having a green centre surrounded by an irregular zone of rich reddish brown, which in turn is margined with golden yellow. The flowers are single and bright carthamus red in colour.

2. Sophia Dumaresque (Dobbie), **F.C.C.** September 4, 1866.—Similar to No. 1, but deeper in colour.

Leaves Variegated with Gold or Yellow.

3. Black Douglas (Dobbie).—Habit compact and bushy; leaves medium-sized, greenish yellow with a moderately broad zone of reddish brown. Flowers white shading to palest orient red at the base of the petals; single.

4. Crystal Palace Gem (Dobbie), **F.C.C.** 1873.—A variety of dwarf. spreading, and very free-flowering habit. Leaves greenish yellow, with a rather large darker green patch in the middle. Spikes good, flowers single, deep carmine, very pretty.

5. Czar (Dobbie).—A compact and very bushy variety with large golden leaves having a very wide zone of dark reddish brown.

6. Harry Hieover (Dobbie), **.C.C.** 1873.—Habit dwarf and spreading; leaves golden with a broad zone of reddish brown. Flowers single, trusses small, bright cherry red in colour.

7. Maréchal MacMahon (Dobbie), **XXX** August 19, 1897.—A compact grower; leaves golden yellow with a broad brownish red zone; flowers small, vermilion red.

Leaves Variegated with Silver or White.

8. Arborfield Gem (Tucker).—A dwarf compact variety with small leaves which are white except for the small blotch of green in the centre. It is said to be a sport from 'Dandy.'

* The numbers prefixed are those by which the variety was alone known until judging had been completed.

9. Flower of Spring (Dobbie), **F.C.C.** April 12, 1860.—Foliage of medium size, round, wrinkled, having a narrow white margin; flowers single, small, light Turkey red. Truss small; habit bushy.

10. Mrs. Parker (Dobbie).—A variety of neat bushy habit with medium-sized wrinkled leaves having a narrow white margin. Truss small; flowers semi-double, rosy pink in colour.

11. Snow Queen (Dobbie).—Habit compact and bushy; leaves margined with white, medium sized. Flowers white, semi-double.

Leaves Zoned or Plain Green.

12. A (Jones).—Flowers bright scarlet, borne very freely, in good trusses; single and of medium size; leaves broadly zoned; a strong grower.

13. Acquisition (Jones).—A variety of compact habit with small single flowers of a rich deep carmine. Leaves deeply zoned.

14. A. Hemsley (Jones).—This variety has large single flowers of a dark velvety geranium lake. It is of compact habit and the leaves are very slightly zoned.

15. Alfred Simpson (Jones).—Habit dwarf and compact; flowers single, deep carmine; leaves with a very distinct narrow zone.

16. Aunt Liza (Jones).—Flowers single, white with a suffusion of pale salmon pink. Leaves very faintly zoned.

17. B (Jones).—A weak grower which failed to flower.

18. Beauty (Dobbie).—Flowers large, single, deep cochineal carmine, borne very freely in good trusses. A strong grower having plain green leaves.

19. Bridget Darby (Jones).—A variety of compact habit with lightly zoned leaves. Flowers single and of a beautiful clear rose pink colour.

20. CC (Jones).—A weak grower with narrowly zoned foliage. Flowers scarlet, single.

21. Champion (Jones).—Flowers small, very deep crimson. Leaves slightly zoned. Habit compact.

22. C. J. H. Day (Jones).—Flowers single, vermilion red. Leaves deeply zoned. A compact grower.

23. Dick Smith (Jones).—A compact grower bearing good trusses of bright scarlet single flowers and having moderately zoned foliage.

24. E. A. Tickle (Jones).—Flowers single, deep scarlet; leaves plain green; a weak grower.

25. EE (Jones).—A very vigorous and rather spreading variety bearing numerous good trusses of bright cerise single flowers. The leaves have a medium dark zone and are very handsome.

26. E. Newman (Jones).—This is a strong-growing, free-flowering variety with moderately zoned foliage and deep geranium single flowers.

27. Freda Gulliver (Jones).—A useful variety of vigorous habit bearing good trusses of large single bright scarlet flowers. Leaves narrowly zoned.

28. Freda Tozer (Jones).—Flowers large, bright scarlet, borne in

large trusses; leaves moderately and often irregularly zoned; vigorous habit.

29. Fred Bunstead (Jones).—A very effective bedding variety with large single flowers of a deep rosy carmine colour. Leaves faintly zoned; habit good, compact, and very free-flowering.

30. Freddie (Jones).—A variety of compact habit with broadly zoned foliage. Failed to flower.

31. G. H. Payne (Jones).—This variety is a weak grower having plain green leaves and rich blood-red single flowers borne in a rather poor truss.

32. Great White Queen (Dobbie).—Flowers semi-double, pure white, borne very freely in good trusses. Leaves plain green; a strong and vigorous grower; very effective.

33. G. Redman (Jones).—Flowers large, single, orange salmon when first opening but deep rosy pink later; leaves slightly zoned; habit free-flowering.

34. H (Jones).—A compact grower with moderately zoned leaves; failed to flower.

35. Harry (Jones).—This is a striking variety of compact habit with large single flowers of a very bright scarlet colour. It is very similar to the variety 'Harry James.' The leaves are moderately zoned.

36. Harry James (Jones).—Flowers single, showy, very bright scarlet; leaves moderately zoned; habit compact.

37. Harry Wood (Jones).—A good grower with single carmine flowers; leaves with a medium dark zone.

38. Henry Jacoby (Dobbie), **XXX** August 19, 1897.—This is probably one of the best known and most generally cultivated of Zonal Pelargoniums. It is of strong and rather spreading habit and bears excellent trusses of large single flowers of a deep cherry red colour.

39. H. J. Jones (Jones).—A variety of compact habit with small, single, strawberry red flowers. Leaves zoned irregularly, the zone becoming often merely a dark suffusion in the middle of the leaf.

40. H. S. Rainforth (Jones).—Flowers small, single, rosy carmine; leaves slightly zoned; habit strong.

41. I (Jones).—A variety of strong and rather spreading growth having the leaves narrowly zoned. Failed to flower.

41. II (Jones).—Flowers large, single, pale purplish rose; leaves plain green; habit compact.

43. J (Jones).—A compact grower with narrowly zoned leaves and medium-sized flowers have a white ground suffused with light Turkey red.

44. James Wraite (Jones).—Flowers large, rich deep velvety crimson shading to cardinal red at the base of the petals. Leaves with a medium zone.

45. J. F. Bunting (Jones).—A vigorous grower with slightly zoned leaves and large single flowers of a light geranium colour.

46. JJ (Jones).—Flowers large, single, cardinal red; leaves large, slightly zoned; a very vigorous grower.

47. King Edward VII (Dobbie).—A good grower of compact habit, bearing an abundance of single flowers of rich dark strawberry red colour. Leaves faintly zoned.

48. King of Denmark (Dobbie), **A.M.** May 5, 1896.—Flowers single, pretty salmon pink suffused with orange; trusses good; leaves broadly zoned; habit strong and vigorous, free-flowering.

49. Mab Stirling (Jones).—Flowers medium-sized, white with a small ring of salmon round the centre; leaves faintly zoned; habit compact and very free-flowering.

50. Meg James (Jones).—A compact grower with leaves having a moderate zone. Failed to flower.

51. Molly (Jones).—Flowers white with a suffusion of crimson at the base of the petals, single; leaves faintly zoned; habit compact.

52. Mrs. A. G. Rodwell (Jones).—A showy variety with rich dark blood-red flowers of large size; leaves mostly plain green but sometimes faintly zoned; habit compact.

53. Mrs. Baker (Jones).—Flowers large, showy, rosy carmine, very similar to those of 'Fred Bunstead' but slightly paler; habit compact; leaves slightly zoned.

54. Mrs. E. Richardson (Jones).—A variety of dwarf and rather weak habit. Leaves narrowly zoned; flowers large, deep rich crimson shading to scarlet at the base of the petals; free-flowering habit.

55. Mrs. F. Green (Jones).—Flowers single, deep strawberry red; leaves with a narrow zone.

56. Mrs. G. H. Woodward (Jones).—A compact-growing variety identical with 'Mrs. Baker.'

57. Mrs. Gulliver Improved (Jones).—Flowers single, pale rose pink; leaves plain green; nice bushy habit.

58. Mrs. H. Carpenter (Jones).—Flowers single, deep blood-red; leaves faintly zoned; habit compact.

59. Mrs. H. Perkins (Jones).—A variety of weak habit with small single flowers of a rosy lilac colour. Leaves plain green or sometimes faintly zoned.

60. Mrs. J. F. Bunting (Jones).—The leaves of this variety are exceptionally large and are beautifully zoned with deep reddish brown; flowers single, deep pink.

61. Mrs. L. Bridger (Jones).—Flowers large, single, rich crimson; leaves plain green; a strong grower.

62. Mrs. Leavers (Dobbie).—A compact and very free-flowering variety bearing good trusses of small, single, bright strawberry red flowers. Leaves small, plain green.

63. Mrs. Rowland May (Jones).—Flowers single, deep rosy pink and white with a suffusion of salmon at the base of the petals; foliage with a medium zone; habit compact.

64. Mrs. Tom White (Jones).—A strong grower but rather shy in flowering; leaves moderately zoned; flowers single, light strawberry red.

65. Mrs. W. A. Cull (Jones).—Flowers single, small, pure white; leaves plain green or sometimes faintly zoned.

66. N (Jones).—Flowers large, single, carmine; leaves moderately zoned; habit compact.

67. Nellie Hemsley (Jones).—A strong grower of nice habit with large moderately zoned leaves. Flowers large, single, geranium.

68. NN (Jones).—Flowers deep velvety scarlet, single; foliage plain green; a weak grower.

69. O (Jones).—A compact grower with plain green leaves sometimes very faintly zoned; flowers single and of a pretty lilac rose.

70. OO (Jones).—A variety of strong growth with very faintly zoned leaves and pretty pale mauve rose single flowers.

71. Pandora (Jones).—Flowers single, bright fiery red; a very vigorous grower; leaves with medium zone.

72. Paul Crampel (Dobbie).—This is undoubtedly one of the best bedding Pelargoniums yet raised. The flowers are large, single, bright scarlet, and are borne in bold trusses. The leaves are large and moderately zoned. The plant is very vigorous and free-flowering.

73. Paul Crampel fl. pl. (Jones).—A double form of this well-known bedding variety; leaves plain green; a vigorous grower; very showy.

74. Paul Crampel Improved (Jones).—Similar to the type.

75. QQ (Jones).—A very free-flowering and compact variety with single bright rosy pink flowers and plain green foliage.

76. Queen of Whites (Dobbie).—Flowers white, single; leaves plain green; a very vigorous grower.

77. R (Jones).—Flowers small, white suffused with deep rose; leaves narrowly zoned; habit compact.

78. Red King (Dobbie).—A strong, spreading grower with narrowly zoned foliage and deep geranium lake single flowers; very free-flowering habit.

79. Reformator (Dobbie).—A good compact grower with splendid trusses of large single scarlet flowers; leaves slightly zoned; very free-flowering.

80. S (Jones).—Flowers single, bright geranium; habit vigorous and strong, free-flowering; leaves narrowly zoned.

81. Scarlet Gem (Jones).—A good vigorous grower with large bright scarlet single flowers borne in good trusses. The leaves are faintly zoned.

82. T (Jones).—Flowers small, single, geranium; leaves plain green; habit weak.

83. T. Day (Jones).—A variety of compact habit with large slightly zoned leaves and pink single flowers.

84. Tom White (Jones).—Flowers large, single, cherry red; leaves slightly zoned.

85. V (Jones).—Flowers single, dark cochineal carmine with pale reverse to the petals; leaves slightly zoned; a strong grower.

86. Vesuvius (Dobbie).—A compact grower with small moderately zoned leaves; flowers single, scarlet; very free-flowering in habit.

87. VV (Jones).—A strong and vigorous grower having narrowly

zoned leaves and bearing good trusses of single flowers which have a white ground prettily suffused with bright salmon.

88. W. A. Cull (Jones).—A compact variety with single carmine purple flowers and large slightly zoned leaves.

89. West Brighton Gem (Dobbie), **F.C.C.** May 25, 1880.—A very free-blooming variety with medium-sized scarlet flowers and leaves having a narrow dark zone. It is a strong grower and rather spreading in habit.

90. Will (Jones).—Flowers large, single, geranium lake, borne in good trusses; leaves plain green or sometimes faintly zoned.

91. X (Jones).—A compact grower with leaves having a medium zone; flowers single, rose Neyron red; free-flowering in habit.

92. XX (Jones).—Flowers single, Turkey red; leaves moderately zoned; strong and vigorous in habit; free-flowering; a useful variety.

93. Y (Jones).—This very effective variety has large carmine flowers borne in good trusses. The leaves have a dark broad zone and the plant is a strong and vigorous grower.

94. YY (Jones).—A compact grower with small, very faintly zoned leaves and Tyrian rose single flowers. It is of free-flowering habit.

95. ZZ (Jones).—Flowers single, pale strawberry red; leaves with a medium zone; habit compact.

96. 508 (Jones).—Flowers large, single, cardinal red; leaves moderately zoned; habit compact.

Ivy-leaved Section.

97. Madame Crousse (Dobbie).—A vigorous variety of trailing habit. Leaves dark green, smooth, succulent, digitate. The semi-double flowers, which are borne very freely in good trusses, are of a charming shade of rose pink.

98. Souvenir de Charles Turner (Dobbie).—This variety is similar in habit to 'Madame Crousse.' The flowers are semi-double, deep rosy carmine in colour and very effective and free-flowering.

MISCELLANEOUS FLOWERING PLANTS AT WISLEY, 1912.

ANTIRRHINUM.

Choice Mixed (Forbes).—A dwarf, compact strain, bearing large flowers of various colours, including deep crimson, orange-scarlet, pink, and yellow.

AQUILEGIA.

'Uppingham Red' (Barr).—Growing on.

ASTER (*Michaelmas Daisy*).

'Corona' (Ballard).—A good grower, reaching the height of 4½ feet. Flowers 1½ inch across, heliotrope, semi-double, disc deep golden yellow. A vigorous grower and a profuse bloomer.

'Fairy' (Ballard).—Height 5½ feet. Flowers 1 inch across, pale heliotrope tinged with bright violet-purple; rays very narrow; disc pale and small. A charming variety of very free-flowering and strong-growing habit.

'Moonlight' (Ballard).—A splendid variety, growing 4½-5 feet high. Flowers 2 inches across, ageratum blue; disc pale. This is probably one of the most effective varieties yet raised. It is a good strong grower.

'Rosy Morn' (Ballard).—Height 4½ feet. Flowers 1½ inch across, purplish-mauve; disc small, deep golden yellow. A very charming variety, of good and vigorous habit.

'Saturn' (Ballard).—A strong grower, reaching the height of 5½ feet. Flowers 1¾ inch across, of a lovely pale shade of bright violet; disc large, deep golden yellow.

ASTER (*Callistephus*).

Branching Shell Pink (Veitch).—See vol. xxxvii. p. 558.

sinensis 'Unicum' (North Row).—A mixed strain of double and single varieties, ranging in colour from white to pink, crimson, and dark blue.

'White Apollo' (R. Veitch).—A good double white variety of medium size. Height 18 inches.

BRACHYCOME.

iberidifolia 'Purple King' (Veitch).—See vol. xxxvii. p. 558.

CAMPANULA.

Loeflingii (Barr).—A charming little half-hardy annual, growing 1 foot high. The stem is sharply angled and covered with stiff white hairs. The leaves are small, ovate-lanceolate, crenate, roundly cordate at the base, and have both surfaces hairy. The flowers, which measure nearly 1 inch across, are of a lovely violet-purple colour, and have a prominent pale yellow stigma.

CHEIRANTHUS.

Allionii (Barr).—A charming plant of compact habit, growing about 1 foot high, with long narrow leaves. It bears numerous racemes of beautiful clear orange flowers, which continue to open well on into the autumn.

CHRYSANTHEMUM MAXIMUM.

'Shasta Semi-double' (R. Veitch).—A plant growing 2 feet high, with dark green, serrate, lanceolate leaves. Flowers white, Daisy-like, 2½ inches across.

CLARKIA.

elegans 'Firefly' (Veitch).—This variety grows nearly 3 feet high and produces in abundance, in the axils of the leaves, large deep rose, double flowers. It is a most valuable annual for garden decoration and for cutting.

elegans fl. pl. 'Brilliant' (Veitch).—See vol. xxxvii. p. 558.

elegans fl. pl. 'Scarlet Queen' (Barr, Veitch).—Similar in habit to the above, but of a deeper colour.

CNICUS.

conspicuus (Barr).—Growing on.

DAHLIA.

All the following varieties are of the 'Collarette' type and were sent in by Messrs. Dobbie:—

Antwerpia, **A.M.** August 27, 1912.—A very free-flowering variety of robust habit. The flowers are 5 inches across and deep scarlet in colour, with an inner ring of yellow florets surrounding the prominent golden centre.

Balmoral.—A crimson variety, having the centre surrounded by a ring of rather elongated white florets streaked with crimson. The flowers stand well above the foliage.

Comtesse Icy Hardegg.—A purple-maroon flower, with a ring of white florets round the small golden centre.

Countess Dougon.—A robust grower, having flowers with rounded petals of a crimson colour shading to white at the tips. A ring of white florets surrounds the centre.

Crimson Queen.—A rather small crimson variety, having a very neat and compact habit of growth. The ring of small florets is whitish-rose in colour.

Diadem.—A very pleasing Dahlia, with broad crimson petals and an inner ring of small white florets. It is a strong grower, and the flowers are large.

Exposition de Lyon.—A reddish-crimson variety, with a ring of pale yellow florets. It is of very robust and free-flowering habit.

Gallia.—The petals of this variety are pale sulphury-yellow splashed with crimson. The smaller florets are sulphury-white.

Goldstern.—A yellow variety, with an inner ring of yellow florets.

The flowers measure 4½ inches across, are borne on strong stems, and are very decorative.

Henri Farman.—A good variety, having medium-sized flowers borne on long stalks. The petals are crimson edged with pale yellow, while the inner ring of small florets is sulphury-white.

Holyrood.—A bright red variety, having the petals tipped with deep yellow and the centre surrounded by a zone of yellow and a ring of pale lemon-yellow florets.

Jupiter.—A useful variety borne on good stems. Flowers pale yellow, flushed with crimson, and having a ring of very pale yellow florets round the centre.

Joseph Jougon.—A bright scarlet variety, with a ring of pale yellow florets round the centre.

Le Congo Belge.—A very dark rich crimson or maroon flower, with an inner ring of whitish florets which contrast pleasingly with the dark colour.

Leitstern.—A very distinct deep velvety-red variety, with a ring of small white florets surrounding the golden-yellow centre.

Meteor.—A large crimson Dahlia, with a collar of primrose-yellow florets. The tips of the petals are pale yellow.

Madam Gygax.—A yellow variety, with red markings and an inner ring of pale yellow florets.

Madam E. Wauters.—An orange-scarlet flower, with a collar of pale yellow florets. The flower-stems of this variety are rather weak.

Maurice Rivoire, **A.M.** September 2, 1911.—This was one of the first varieties of the 'Collarette' type to receive an award, and it is considered to be a good example of the class. It is an exceptionally robust grower and very free-flowering in habit. The colour is crimson with rose shading, and the collar is composed of white florets, which make a pleasing contrast with the darker colour.

Prince de Venosa, **A.M.** September 26, 1911.—A good crimson variety of large size, with an inner ring of white florets. It is a strong grower, and the flower-stems are strong and of good length.

Princess Charlotte.—A free-flowering, fiery crimson variety, with a pale yellow collar.

Queen Bess.—This is one of the best of the section for garden decoration. In addition to being remarkably free-flowering it has the very desirable adjunct of stiff, strong stems, which hold the flowers well above the foliage. The colour is a pretty shade of reddish-orange tipped with yellow, with a deep yellow collar.

Rheinkrone.—A good dark red variety of free-flowering habit, with a ring of white florets surrounding the centre.

Souvenir de R. Bernardeau.—This is a strong grower, possessing long and very rigid flower-stems. The blooms are crimson, with a conspicuous collar of long pale yellow florets.

Delphinium.

'Blue Butterfly' (R. Veitch).—See vol. xxxvi. p. 704.

Choice Mixed (Forbes).—Growing on.

DIMORPHOTHECA.

aurantiaca (North Row), **A.M.** May 26, 1908.—See vol. xxxvi. p. 704.

aurantiaca hybrids (Veitch).—A good strain, comprising shades of yellow, orange, salmon, and white.

New hybrids (Barr).—A beautiful strain of this useful annual. Some of the most noticeable of the varied colours were pale yellow, pale salmon-pink, and deepest orange.

GODETIA.

'Crimson Glow' (R. Veitch).—See vol. xxxvi. p. 705.

HELIANTHUS.

'Helios' (R. Veitch).—A strong grower, reaching the height of 6 feet. It had not flowered when the report was drawn up.

HEUCHERA.

convallaria nivea (R. Veitch).—Growing on.

HOLLYHOCK.

'Newport Pink' (Dreer), **A.M.** July 26, 1912.—An excellent strain. The flowers measure 4½ inches in diameter and are very fully double in the centre, which is surrounded by an outside row of very large, broad and prettily crinkled petals. The colour is deep lilac-rose and the height 8 feet. All the plants raised were absolutely true to character, and no rogues appeared.

LARKSPUR.

Stock Flowered, Rosy Scarlet (North Row).—Height 3 feet; habit much-branched and very free-flowering. Flowers 1¼ inch across.

LATHYRUS.

latifolius 'Snow Queen' (Barr).—Growing on.

LINARIA.

maroccana 'Excelsior' (Veitch).—A charming plant, ranging in height from 1½-2 feet. The flowers vary in colour from pure white, through shades of pink and crimson, to deep violet-purple.

LUPINUS.

atrosanguineus (North Row).—A strong-growing annual, reaching 3 feet in height, bearing spikes of small white and crimson flowers.

LYCHNIS.

grandiflora alba (Barr).—Height 18 inches, bearing numerous cymes of pure white single flowers, consisting of five regular obcordate petals, and measuring 1½ inch across. The calyx is deeply furrowed, and the acute, entire, linear leaves are 2 inches long. This is a very effective plant in masses on the rockery or herbaceous border.

MATRICARIA.

eximia 'Golden Ball' (Veitch).—See vol. xxxvii. p. 559.

Myosotis.

'Alpine Blue' (Barr).—See vol. xxxvi. p. 706.
'Ruth Fischer' (Barr).—Growing on.

Nasturtium.

'Feltham Beauty' (Veitch).—See vol. xxxvii. p. 560.
'Queen of Tom Thumb' (R. Veitch).—See vol. xxxvi. p. 706.

Nemesia.

'Orange Prince' (Barr).—See vol. xxxvi. p. 706.
'Fire King' (Barr).—See vol. xxxvi. p. 706.

Nigella.

hispanica (Bartholomew).—A charming annual from Spain and Southern France. It grows from 1-2 feet tall, and its large flowers are deep violet-blue with blood-coloured stamens.

Pansy.

Fancy Strain (Forbes).—A strong-growing strain, with large foliage and flowers. Colours ranging from deep yellow to pale blue and deep violet-purple.

Pentstemon.

Forbes' Hybrids (Forbes).—Growing on.

Petunia.

Veitch's Superb Dwarf Rose (Veitch).—A strong grower of spreading habit, with an abundance of deep rose flowers measuring 2 inches across.

Polyanthus.

Forbes' Hybrids (Forbes).—Growing on.

Salvia.

patens 'New Early Dwarf' (Barr).—See vol. xxxvi. p. 707.
splendens 'Fireball' (Barr).—See vol. xxxvi. p. 707.

Stock.

Brompton, 'Empress Elizabeth' (Veitch).—A strong-growing variety, bearing large fully double flowers of a beautiful deep rose colour.

'Dwarf Crimson Gem' (Barr).—See vol. xxxvi. p. 707.

East Lothian, Crimson (Forbes).—See vol. xxxvi. p. 707.

East Lothian, Crimson Wallflower-leaved (Forbes).—See vol. xxxvi. p. 707.

East Lothian, Purple (Forbes).—See vol. xxxvi. p. 707.

East Lothian, Rose (Forbes).—See vol. xxxvi. p. 707.

East Lothian, Scarlet (Forbes).—Slightly over 1 foot high. Flowers single, scented, deep reddish-violet in colour.

East Lothian, White (Forbes).—See vol. xxxvi. p. 707.

East Lothian, White Wallflower-leaved (Forbes).—See vol. xxxvi. p. 707.

Intermediate 'Giant White' (R. Veitch).—Height about 18 inches. Flowers both single and double, white, strongly scented.

VIOLA.

Choice Mixed (Forbes).—A good strain of various colours, ranging from white to deep violet-purple.

ZINNIA.

elegans 'Fire King' (Veitch).—See vol. xxxvii. p. 560.

FIG. 191.—THE MELON HOUSE AT WISLEY. [Photo: C. F. Ireland.

MELONS AT WISLEY, 1912.

Forty stocks of Melons were sent in for trial. They were sown on April 18 and planted out on a prepared bed on May 16. All the plants did well, making clean and healthy growth, and on the whole set well, a splendid trial resulting. They were inspected by a Sub-Committee of the Fruit and Vegetable Committee, who expressed themselves strongly on the fine growth and general excellence of the trial.

F.C.C. = First-class Certificate.
A.M. = Award of Merit.

*1. A1 (Sutton).—Fruits large, averaging 6-7 lb. each, oval, pale green when growing, heavily netted; flesh nearly 2 inches deep, scarlet, melting, and of fine flavour. Plant strong and a free setter.

2. Ashton Gem (Strugnell).—A strong and vigorous grower which failed to fruit at Wisley.

3. Beauty of Syon (J. Veitch), **F.C.C.** October 18, 1892.—Fruits of medium size, averaging 6 lb. in weight, beautifully netted; flesh scarlet, 1½ inch deep, and of delicious flavour. Constitution strong.

4. Best of All (Sutton).—Fruits large, averaging 7 lb. each; pale green when growing, coarsely netted; flesh green, thick, of very good flavour. Plant of moderate growth; shy setter.

5. Blenheim Orange (J. Veitch), **F.C.C.** September 14, 1880.—Fruits of good size, averaging 7½ lb. in weight, pale green when growing, nicely netted; flesh very thick, scarlet, melting, and of delicious flavour. A moderately strong grower.

6. Bountiful (J. Veitch).—This variety is the result of a cross between 'Earl's Favourite' and 'Parisian Cantaloup.' The fruits are oval and deeply ribbed like the 'Cantaloup' type, and while growing are of a greenish-white colour with practically no netting. Weight averaging 5-6 lb. each; flesh scarlet, 1½ inch deep, sweet, excellent flavour. Constitution very vigorous and healthy.

7. Eastnor Castle (Barr), **A.M.** August 9, 1907.—Fruits large, averaging 5-6 lb. each; dark green when growing and finely netted. Flesh green, 1½ inch deep, excellent flavour. A free setter and a strong grower.

8. Eminence (J. Veitch), **A.M.** June 25, 1907.—A beautifully netted fruit of dark green colour when growing. Average weight 6 lb.; flesh white, 1½ inch deep, of delicious flavour. Plant strong and robust, a good setter, carrying four fruits.

9. Emerald Gem (Sutton), **A.M.** July 26, 1892.—Fruits averaging 7-8 lb in weight, beautifully netted, dark green when growing. Flesh

* See footnote p. 549.

green, 2 inches deep and of excellent flavour. Plant vigorous in growth, shy setter.

10. Empress (Sutton).—A very healthy and vigorous grower which sets well. Fruits of medium size, round, averaging 6-7 lb. each; flesh scarlet, 2 inches deep, and of good flavour.

11. Equality (Glasheen).—Fruits long and oval, dark green when growing, finely netted, averaging 5-6 lb. each; flesh scarlet. A strong grower.

12. Excellence (Strugnell).—A very robust grower which sets well and produces good fruits of a dark green colour when growing. Average weight 6-7 lb.; flesh green, 2 inches deep.

13. Frogmore Scarlet (J. Veitch), **F.C.C.** August 13, 1912.—Fruits handsome, long oval, of very pale straw colour, average weight 6-7 lb. each, beautifully netted. Flesh scarlet, 2 inches thick; flavour excellent. Constitution strong and vigorous; a free setter.

14. Frogmore Scarlet (Barr).—An excellent Melon in every way, true to the variety in the colour of the flesh and nearly so in the colour of the skin, but differing in shape, being quite round. Netting perfect; flesh scarlet, 2 inches thick; average weight 7½ lb. A fairly strong grower.

15. Golden Beauty (Barr), **A.M.** August 30, 1910.—A strong grower which sets well. Fruits finely netted, dark green when growing. Flesh scarlet, 1½ inch deep. Average weight of fruits 6½ lb.

16. Gunton Scarlet (J. Veitch), **A.M.** October 11, 1898.—Fruit of medium size, averaging 4-5 lb. each; long oval in shape; nicely netted; flesh scarlet, 1½ inch deep; fine flavour. A vigorous grower and a free setter.

17, 18. Hero of Lockinge (J. Veitch, Sutton), **F.C.C.** August 13, 1912.—Fruits of medium size, averaging 5-6 lb. each; round; very pale green when growing, and bright yellow when ripe; coarsely netted; flesh white; 1½ inch thick, melting, and of delicious flavour. A strong grower and free setter.

19. John Massey (Rowlands), **F.C.C.** August 27, 1912.—A very strong grower bearing fruits of medium size, averaging 4-5 lb. each; nicely netted; pale green when growing; base of fruit rough. Flesh scarlet, 1½ inch thick, and of excellent flavour.

20. King George (R. Veitch).—A robust grower and a good setter; fruits pale green when growing; netting perfect; flesh scarlet, 1½ inch deep; average weight 5-6 lb.

21. Little Heath (J. Veitch), **F.C.C.** May 15, 1872.—Fruits of medium size, of the 'Cantaloup' type; averaging 6-7 lb. each; long and ribbed and pale green when growing. Flesh scarlet, 2 inches thick. Plant vigorous and healthy in growth and a good setter.

22. Mauldslie Castle (Barr), **A.M.** September 13, 1910.—Fruits pale green when growing, finely netted; average weight 6-7 lb. each; flesh green, 1½ inch thick. A strong grower and a free setter, arriving at maturity late.

23. Premier (J. Veitch), **A.M.** August 16, 1910.—An exceptionally

early variety, arriving at maturity a fortnight in advance of most varieties. Fruits large, averaging 7 lb. each, oval, slightly ridged and heavily netted, straw colour; flesh greenish, thick, of excellent flavour. The plant is a strong and vigorous grower and sets freely.

24. Perfection (Sutton), **A.M.** August 20, 1907.—Fruits large, averaging 6-7 lb. each; shape round; colour dark green when growing, beautifully netted; flesh green, 2 inches thick, and of delicious flavour. A strong grower and a very free setter.

25. Ringleader (Sutton).—Fruits of medium size, averaging 5 lb. each, pale greenish-yellow when growing, finely netted; flesh green, 2 inches thick. A strong grower, free setter, and heavy cropper.

26. Rival (Nutting).—A strong grower which sets freely and bears medium sized fruits averaging 5-6 lb. each; finely netted; dark green when growing. Flesh scarlet, 1 inch deep.

27. Royal George (Glasheen).—A good early variety of vigorous growth. Fruits dark green when growing, perfectly netted; flesh white, 2 inches thick; average weight 7-8 lb. each. A free setter.

28. Royal Favourite (Sutton), **A.M.** August 13, 1912.—Fruits of medium size averaging 4-5 lb. each; shape round; colour pale green when growing; moderately netted. Flesh white, 1½ inch thick, melting, and of excellent flavour. A strong and vigorous grower.

29. Royal Jubilee (Sutton).—Fruits pale straw colour when growing, beautifully netted, 6-7 lb. each; flesh green, 2 inches deep, of good flavour. Constitution robust. A free setter.

30. Sedgwick Gem (Ferguson).—A vigorous grower and a free setter. Fruits dark green when growing, imperfectly netted, averaging 6 lb. each; deep golden-yellow when ripe; flesh scarlet, 2 inches deep, good flavour.

31. Sutton's Scarlet (Sutton), **F.C.C.** August 9, 1907.—Fruits of medium size, averaging 6 lb. each; shape round, handsome, beautifully netted; flesh scarlet, over 2 inches deep, and of excellent flavour. A strong grower and a free setter.

32. Superlative (Sutton).—Fruits of medium size, averaging 6-7 lb. each; shape round; finely netted. Colour dark green when growing. Flesh scarlet, nearly 2 inches deep, becoming green near the skin; of good flavour. A robust grower and a good setter.

33, 34. The Manchester (Dickson & Robinson, Barr).—A strong and vigorous grower, rather shy in setting. Fruit green when growing, averaging 5-6 lb. each; flesh scarlet, 1½ inch deep, flavour good.

35. Universal (Sutton).—Fruits dark green when growing, finely netted; flesh white, 2 inches deep, melting, and of excellent flavour. Average weight of fruit 7-8 lb. A good strong grower and a free setter.

36. Western Hero (Strugnell).—Fruits dark green when growing, moderately netted; flesh white, 1¼ inch deep. Average weight of fruit 6 lb. A vigorous grower and a free setter.

37. Seedling (Tidy).—A strong grower and a free setter. Fruits

dark green when growing, beautifully netted; flesh faint scarlet, 1½ inch thick; maturity reached early; average weight 8 lb.

38. Emerald Gem × Royal Jubilee (Bell).—Sent in late. A very strong grower, but a shy setter. Fruits dark green when growing, turning to reddish-chrome when ripe, well netted; flesh green, thick; average weight 7 lb.

39. Algerian (Levy).—Sent in late. A 'Cantaloup' Melon of robust habit; fruit long oval, ribbed, dark green while growing, changing to orange when ripe; rough at the base; flesh scarlet, 2½ inches deep, flavour poor; average weight 12 lb.

40. Prescott Fond Blanc (Levy).—Another 'Cantaloup' variety; sent in late. Fruits of immense size, measuring as much as 32 inches round. The largest fruit obtained of this variety at Wisley weighed 17½ lb., but the average weight was 11 lb. Flesh scarlet, 4-5 inches deep, and of rather strong flavour.

POTATOS AT WISLEY, 1912.

Seventy-nine stocks of Potatos were sent in for trial. They were planted on well-manured ground in rows three feet apart. In most cases the crop was good, but one or two stocks failed entirely. The trial was inspected by a Sub-Committee of the Fruit and Vegetable Committee, and eight varieties were selected to be cooked and placed before the full Committee. It is interesting to note that three of these had already received awards, one receiving a First-class Certificate in 1874, whilst one new variety received this high award this season, three others gaining an Award of Merit.

A variety of Ashleaf Kidney (No. 14), which has been grown annually on the same border by Mr. Potter, Gardener, Whitehall, Cumberland, and his father before him since 1861, was highly commended (**XXX**). These Potatos turned out well at Wisley, yielding a heavy crop of beautiful, clean tubers:—

F.C.C. = First-class Certificate.
A.M. = Award of Merit.
XXX = Highly commended.

List of Varieties.

*1. Alpha.
2. Midlothian Early.
3. Midlothian Early.
4. Sharpe's Express.
5. Sharpe's Express.
6. Sharpe's Victor.
7. Sharpe's Victor.
8. Lady Llewelyn.
9. Lady Llewelyn.
10. Sir John Llewelyn.
11. Sir John Llewelyn.
12. Ashleaf (selected).
13. Ashleaf, Myatt's.
14. Ashleaf Kidney.
15. Milecross Early.
16. Irish Gem.
17. John Bull.
18. Duke of York.
19. Boston Kidney.
20. Bath's Early.
21. Puritan.
22. Ringleader.
23. Dalmeny Early.
24. Early Rose.
25. Epicure.
26. Beauty of Hebron.
27. May Queen.
28. Russet Queen.
29. British Queen.
30. Princess May.
31. The Colleen.
32. Leader.
33. Bountiful.
34. King George V.
35. James Gibson.
36. William Cuthbertson.
37. Bonnie Dundee.
38. Andrew Ireland.
39. Edwin Beckett.
40. D. P. Laird.
41. Conquest.
42. Favourite.
43. King Edward.
44. Windsor Castle.
45. His Majesty.
46. Queen Mary.

* See footnote p. 549.

47. Exonian.
48. Wydecombe Beauty.
49. Great Scot.
50. British Queen.
51. Ninetyfold.
52. Windsor Castle.
53. Harbinger.
54. Southern Star.
55. Cambria.
56. Reliance.
57. Hero.
58. Snowdrift.
59. Norfolk Beauty.
60. Daniels' Surprise.
61. Imperial Beauty.
62. Irish King.
63. The Diamond.
64. Snowdrop.
65. Hillside Gem.
66. Scottish Chief.
67. Cash in Hand.
68. Sackville.
69. Cigarette.
70. Wydecombe.
71. International Gem.
72. Forest Ruby.
73. Witchhill Seedling.
74. Coral Red Kidney.
75. Exhibition Kidney.
76. The Factor.
77. Up to Date.
78. Lord Steyne.
79. St. Lawrence.

78 and 79 were planted a month later than the others.

Early Varieties.

1. Alpha (Dobbie), **A.** . July 28, 1903.—Haulm fairly strong, spreading, light green, with no flowers. Large round white tubers, eyes numerous, deep sunken, eyebrows pronounced. Crop good, no trace of disease.

12. Ashleaf (selected) (Barr).—Haulm very weak. Poor crop.

14. Ashleaf Kidney (Potter), **XXX** July 30, 1912.—Haulm strong, light green, spreading, with mauve flowers; came into flower June 12, 1912. Medium sized white kidney, eye shallow, eyebrows slightly pronounced. Crop good, slightly diseased.

13. Ashleaf, Myatt's (Dobbie).—Haulm fairly strong, light green, spreading, with pale mauve flowers; came into flower June 14, 1912. Fairly small white kidney, eye shallow, eyebrow indistinct. Good crop, diseased.

20. Bath's Early (Bath).—Haulm weak, light green, erect, with white flowers; in flower June 21, 1912. Small white kidney, eye rather deep, eyebrow not pronounced. Fairly good crop, free from disease.

26. Beauty of Hebron (Barr), **A.M.** August 14, 1900.—Haulm moderate, light green, spreading, with white flowers; came into flower June 14, 1912. Pink kidney, variable in size, eye deep, eyebrow pronounced. Crop good, free from disease.

19. Boston Kidney (Waite).—Haulm strong, darkish green, spreading, with no flower. Good sized white kidney, eye shallow, eyebrow pronounced. Good crop, free from disease.

33. Bountiful (Bath), **F.C.C.** September 10, 1874.—Haulm mediumly strong, dark green, erect. Medium flat kidney, eye shallow. Crop poor, diseased.

29. British Queen (Dobbie), **A.M.** August 15, 1905.—Haulm

very strong, dark green, erect, with white flowers; came into flower June 13, 1912. Round white tubers, eye rather deep. Fairly free from disease.

23. Dalmeny Early (Barr), **A.M.** September 13, 1900.—Haulm weak, light green, spreading, with few white flowers; came into flower June 25, 1912. Medium sized round white kidney, eye shallow, eyebrow pronounced. Crop fair, slightly diseased.

18. Duke of York (Dobbie).—Haulm strong, light green, spreading. Medium sized round white tubers, eye shallow, eyebrows rather distinct. Crop very good, free from disease.

24. Early Rose (Barr).—Haulm fairly strong, pale green, spreading. Large pink kidney, eye deep sunken, eyebrow pronounced. Crop very good, free from disease.

25. Epicure (Barr), **A.M.** August 15, 1905.—Haulm strong, dark green, erect, with white flowers; came into flower June 15, 1912. Medium round white tubers, eye deep sunken, eyebrow pronounced, not diseased. Crop good.

16. Irish Gem (Sands), **A.M.** July 30, 1912.—Haulm extremely strong (strongest in trials), deep green, spreading, with pale blue flowers; in flower June 10, 1912. Good sized round white tubers, eye shallow, eyebrow slightly pronounced. Heavy crop, free from disease.

17. John Bull (Dobbie).—Haulm very weak. Crop too poor to describe.

34. King George V. (Sands), **A.M.** July 30, 1912.—Haulm strong light green, spreading, with white flowers; came into flower June 18, 1912. Rather small but uniform round white tubers, eye shallow, slightly pronounced. Free from disease.

8. Lady Llewelyn (Dobbie).—Haulm strong, light green, erect, with few small white flowers; came into flower June 23, 1912. Medium sized round white tubers, eye rather sunken, eyebrows not prominent. Good crop, free from disease.

9. Lady Llewelyn (R. Veitch).—Haulm weak, light green, erect, with few white flowers; came into flower June 21, 1912. Medium sized round white tubers, eye rather sunken, eyebrow prominent. Poor crop, not diseased.

32. Leader (Bath).—Haulm weak, light green, no flower. Round white kidney of variable size, eye shallow, eyebrow not pronounced. Crop fair, free from disease.

27. May Queen (Barr), **A.M.** August 15, 1905.—Haulm weak, light green, spreading, with purple flowers; came into flower June 17, 1912. Medium sized white kidney, eye very shallow, eyebrow indistinct. Diseased.

2, 3. Midlothian Early (Sydenham, Dobbie), **A.M.** July 31, 1908.—Haulm strong, spreading, light green, with no flowers. Medium sized round white tubers, eyes very shallow, eyebrows indistinct. Crop good, only very slightly diseased.

15. Milecross Early (Dobbie).—Haulm very strong, pale green,

erect, with no flower. Good sized round white tubers, eyes few and shallow, eyebrows indistinct. Crop very good, free from disease.

30. Princess May (Dobbie).—Haulm very strong, dark green, erect, with white flowers; came into flower June 14, 1912. Flat kidney, eye very shallow. Only slightly diseased.

21. Puritan (Barr).—Haulm weak, erect, light green, with white flowers; came into flower June 11, 1912. Small to medium, white kidney, deep eye, eyebrow slightly pronounced. Crop fair, not diseased.

22. Ringleader (Barr), **A.M.** July 10, 1900.—Haulm fairly strong, light green, spreading, with no flowers. Small white kidney, eye shallow, eyebrow rather pronounced. Crop poor, free from disease.

28. Russet Queen (Dobbie), **A.M.** October 23, 1906.—Haulm very strong, erect, dark green, with white flowers; came into flower June 13, 1912. Medium flat kidney, eye shallow. Good crop, free from disease.

4, 5. Sharpe's Express (Dobbie, Barr).—Haulm strong, spreading, dark green, with mauve flowers; came into flower June 21, 1912. Medium sized white kidney shaped tubers, eye shallow, eyebrows not pronounced. Crop fair, diseased.

6, 7. Sharpe's Victor (Dobbie, Barr), **A.M.** August 14, 1900.—Haulm strong, light green, spreading, with pale blue flowers; came into flower June 11, 1912. Small white round kidney, eye fairly shallow, eyebrows slightly pronounced. Fair crop, no disease.

10, 11. Sir John Llewelyn (Dobbie, Barr), **A.M.** September 11, 1900.—Haulm strong, darkish green, erect, with few white flowers; came into flower June 19, 1912. Medium sized white kidney, eye rather sunken, eyebrows prominent. Very good crop, free from disease.

31. The Colleen (Sydenham), **A.M.** August 9, 1907.—Haulm very strong, light green, erect, with white flowers; came into flower June 16, 1912. Flat kidney, eye shallow. Fairly free from disease.

Mid-Season and Late Varieties.

38. Andrew Ireland (Staward).—Haulm weak, dark green, erect, with purple flowers; came into flower June 23, 1912. Small round kidney, eye shallow. Crop very poor, badly diseased.

37. Bonnie Dundee (Staward).—Haulm very weak, light green, spreading, with no flower. Very small white kidney, eye shallow, eyebrow not pronounced. Crop poor, not diseased.

55. Cambria (Veitch).—Too poor to describe.

67. Cash in Hand (Boyce).—Haulm weak. Very poor and diseased crop.

69. Cigarette (Barr), **A.M.** November 21, 1905.—Haulm strong, dark green, spreading, with no flower. Medium round kidney, eye shallow. Good crop, not diseased.

41. Conquest (Dobbie), **XXX** September 10, 1912.—Haulm very strong, light green, spreading, with very pale green flowers; came into

flower June 19, 1912. Medium round kidney, eye deep. Good crop, badly diseased.

74. Coral Red Kidney (Toogood).—Haulm weak. Crop medium flat red kidney, with shallow eyes. No disease.

60. Daniels' Surprise (Daniels).—Haulm very strong, dark green, erect, with purple flowers; came into flower June 19, 1912. Medium round, shallow eye. Good crop, slightly diseased.

40. D. P. Laird (Staward).—Too poor to describe.

39. Edwin Beckett (Staward).—Haulm very weak, light green, spreading, with purple flowers; came into flower June 19, 1912. Medium flat kidney, eye shallow. Crop fair, badly diseased.

75. Exhibiton Kidney (Daniels).—Haulm fairly strong, dark green, spreading, no flower. Medium flat kidney, eye very shallow. Crop medium, diseased.

47. Exonian (Fletcher).—Haulm very weak. Tubers too poor to describe.

42. Favourite (Dobbie), **F.C.C.** August 20, 1907.—Some plants very strong while others rather weak, dark green, erect, with white flowers; came into flower June 17, 1912. Medium round kidney, shallow eye. Poor crop, diseased.

72. Forest Ruby (Toogood).—Haulm strong, dark green, erect, with purple flowers; came into flower June 20, 1912. Medium flat red kidney, eye shallow. Crop moderate, no disease.

49. Great Scot (R. Veitch), **A.M.** September 26, 1911.—Haulm strong, dark green, erect, with small white flowers; came into flower June 25, 1912. Medium round tubers, eye shallow. Crop medium, slightly diseased.

53. Harbinger (Barr), **A.M.** August 5, 1897.—Haulm strong, light green, erect, some of the flowers white, others purple; came into flower June 19, 1912. Flat kidney, eye shallow. Crop medium, fairly free from disease.

57. Hero (Veitch).—Haulm weak. Crop very poor.

65. Hillside Gem (Stokes).—Haulm weak, purple flowers. Small round tubers, shallow crimson eye. Crop poor, free from disease.

45. His Majesty (Fletcher).—Haulm weak, light green, erect, with purple flowers; came into flower June 19, 1912. Large flat kidney, eye shallow. Crop fair, slightly diseased.

61. Imperial Beauty (Barr), **A.M.** July 30, 1912.—Haulm strong, dark green, spreading, with white flowers; came into flower June 23, 1912. Medium white kidney, eye deep, eyebrow pronounced. Fair crop, not diseased.

71. International Gem (Sands).—Haulm very strong, light green, spreading, with few white flowers. Medium round, eye shallow. Crop very good, not diseased.

62. Irish King (Barr).—Haulm very strong, light green, erect, with purple flowers; came into flower June 20, 1912. Small round kidney, eye shallow. Crop moderate, slightly diseased.

35. James Gibson (Staward), **XXX** September 10, 1912.—Haulm

very strong, dark green, spreading, with white flowers; came into flower June 15, 1912. Medium round kidney, eye shallow. Good crop, somewhat diseased.

43. King Edward (Sydenham).—Haulm mediumly strong, darkish green, erect, with white flowers; came into flower June 18, 1912. Medium flat kidney, pink shallow eyes. Good crop, free from disease.

78. Lord Steyne (Letts).—Haulm very strong, light green, spreading, with purple flowers. Medium round, eye shallow. Crop moderate, slightly diseased.

51. Ninetyfold (Barr), **A.M.** July 10, 1900.—Haulm mediumly strong, light green, spreading, with white flowers; came into flower June 17, 1912. Medium-sized white kidney, eye shallow, eyebrow indistinct. Fair crop, free from disease.

59. Norfolk Beauty (Daniels).—Haulm very strong, darkish green, erect, with white flowers; came into flower June 19, 1912. Medium round white tubers, shallow eye. Good crop, slightly diseased.

46. Queen Mary (Fletcher).—Haulm very weak. Crop very poor.

56. Reliance (Veitch).—Complete failure.

68. Sackville (Boyce).—Haulm weak. Crop poor.

66. Scottish Chief (Barr).—Haulm very strong, dark green, spreading, with purple flowers; came into flower June 25, 1912. Medium round kidney, eye shallow. Crop good, practically free from disease.

58. Snowdrift (Veitch).—Haulm weak. Crop poor and badly diseased.

64. Snowdrop (Improved) (Barr).—Haulm weak. Crop poor.

54. Southern Star (Veitch), **A.M.** November 21, 1905.—Haulm very weak. Crop practically nil.

79. St. Lawrence (Letts).—Haulm fairly strong, very dark green, no flower. Large round kidney, eye shallow. Crop poor, badly diseased.

63. The Diamond (Barr), **A.M.** September 10, 1912.—Haulm very strong, dark green, erect, with white flowers; came into flower June 18, 1912. Medium oval kidney, eye shallow. Crop heavy, not diseased when lifted.

76. The Factor (Barr), **F.C.C.** April 25, 1905.—Haulm very strong, dark green, erect, with some purple and some white flowers; came into flower June 19, 1912. Small round kidney, eye shallow. Crop moderate, slightly diseased.

77. Up to Date (Barr).—Haulm very strong, dark green, erect, with white flowers; came into flower June 19, 1912. Medium round kidney, eye shallow. Crop moderate, diseased.

36. William Cuthbertson (Staward).—Haulm extremely poor. Too poor to describe.

44, 52. Windsor Castle (Dobbie, Barr), **F.C.C.** September 12, 1893.—Haulm very strong, dark green, erect, with white flowers; came

into flower June 15, 1912. Medium white round, eye shallow, prominent eyebrows. Crop No. 44 poor, No. 52 fair, slightly diseased.

73. Witchhill Seedling (Smith), **F.C.C.** July 30, 1912.—Haulm very strong, dark green, spreading, with white flowers; came into flower June 19, 1912. Medium round white tubers, very uniform, eye shallow, eyebrow not pronounced. Crop very heavy, quite free from disease.

70. Wydecombe (Pickering).—Haulm strong, light green, erect, with purple flowers; came into flower June 18, 1912. Medium flat kidney, eye shallow. Crop good, slightly diseased.

48. Wydecombe Beauty (Pickering).—Haulm rather weak, light green, erect, with purple flowers. Medium flat kidney, eye shallow. Poor crop, slightly diseased.

VEGETABLE MARROWS AT WISLEY, 1912.

Forty different stocks were sent in. Germination was a little irregular, but on the whole a fine trial resulted.

The advantage of the Bush Marrows over those of trailing habit was very noticeable. Their compact growth and free-cropping qualities make them particularly desirable where early forced vegetables are in demand, as they do not require much room in a frame, and the marrows are borne closely together.

The trial was inspected by a Sub-Committee of the Fruit and Vegetable Committee, when four varieties were selected to be placed before the full Committee. Three received awards, the fourth having previously received an Award of Merit.

A.M. = Award of Merit.

* 1. Bush Green (Barr), **A.M.** August 13, 1912.—Very vigorous-growing marrow of the bush type, about 30 inches in height, bearing a heavy crop of large, long, oval, dark-green striped marrows, slightly ribbed and borne close together.

2. Bush Vegetable Marrow (J. Veitch).—A strong-growing bush marrow, about 2 feet high, bearing a good crop of medium-sized, long green-striped marrows, slightly ribbed.

3. Defiance (J. Veitch), **A.M.** September 1, 1903.—A strong-growing marrow of trailing habit. The trails are not numerous. Fair crop of short, oval, green-striped smooth marrows of good size.

4. Delicacy (Toogood).—A very vigorous-growing marrow of trailing habit; trails long and numerous, with fair crop of smooth, green-striped marrows.

5. Earliest of All (Smith).—Very vigorous-growing marrow of the trailing type, trails numerous. Heavy crop of large, oval, dark-green striped, ribbed marrows. Stock requires more selection.

6. Hillside Selected (Stokes).—This stock failed to germinate.

7. Improved Custard (Sutton).—A weak-growing marrow, but with fair crop of small cream custard marrows.

8. Improved Green Bush (Sutton).—A fairly strong-growing bush marrow, about 2 feet high, with fair crop of large, oval, green-striped marrows. Stock requires more selection.

9. Improved Yellow Custard (Barr).—Weak-growing bush marrow; poor crop of yellow custard marrows.

10. King's Acre Cream (Barr).—A strong-growing variety, of trailing habit, bearing a good crop of very large cream marrows which are long, pointed, and slightly ribbed.

* See footnote p. 549.

11. Long Cream (Veitch).—A very vigorous grower of the trailing type, covering a large area, and carrying a good crop of medium-sized, long, slightly ribbed, cream marrows.

12, 13, 14.—Long Green (Dobbie, Sutton, R. Veitch).—A very vigorous, trailing variety, carrying a good crop of long, green-striped, ribbed marrows of large size.

15. Long Green Striped (Barr).—Similar to the preceding, but requiring more selection.

16, 17. Long White (Dobbie, Sutton).—A strong grower of the trailing type, bearing a fair crop of long, white, ribbed marrows of medium size.

18. Long White Ribbed (Barr).—Similar to 16 and 17.

19, 20, 22, 23. Moore's Cream (Barr, Nutting, J. Veitch, R. Veitch), **A.M.** August 13, 1912.—An excellent variety, of strong growth and trailing habit. The smooth cream marrows are produced abundantly; small and oval in shape.

21. Moore's Cream Striped (Nutting).—A weak grower, of trailing habit, bearing a fair crop of small green-and-yellow striped marrows of oval shape.

24. Pale Green Bush (Nutting).—A strong-growing variety of the bush type, reaching the height of about 2 feet, and bearing a fair crop of long, pale green, slightly ribbed marrows. Stock requires more selection.

25, 26, 27, 28. Pen-y-byd (Barr, Sutton, J. Veitch, R. Veitch).—A most useful variety, of trailing habit and medium growth, producing a heavy crop of small, smooth, round, yellow marrows.

29. Pen-y-byd Green (J. Veitch).—Similar in habit to the preceding, but requiring more selection.

30. Perfection (Sutton).—A fairly strong grower, of trailing habit, bearing a good crop of small, roundish, dark-green striped smooth marrows. Stock requires more selection.

31. Pepo Cucurbita (Millard).—A very vigorous grower, of trailing habit, bearing a good crop of large, round, slightly ribbed marrows, pale green in colour.

32. Prolific (Dobbie).—A strong-growing variety, of trailing habit, bearing a heavy crop of small, yellow, smooth marrows of oval shape. Stock requires more selection.

33. Sutton's Marrow (Sutton), **A.M.** September 1, 1903.—A fairly strong grower, of trailing habit, carrying a heavy crop of small, oval, smooth, yellow marrows.

34, 35. Table Dainty (Barr, Sutton).—A weak-growing variety, of trailing habit, producing a fair crop of small, oval, dark-green striped, smooth marrows.

36. Tender and True (Sutton).—A fairly strong-growing variety of the bush type, bearing a heavy crop of light-green round marrows of fair size, which are borne closely together round the centre of the plant. Stock requires more selection.

37. True Cluster (R. Veitch).—A rather weak-growing bush

variety, producing only a poor crop of small custard marrows. Stock requires more selection.

38, 39. White Bush (Nutting, Sutton), **A.M.** August 13, 1912.—A strong grower, of spreading bushy habit, reaching about 2 feet high, producing a very heavy crop of long, oval, white marrows, slightly ribbed and of medium size.

40. White Bush or Cluster (Barr).—Similar to the preceding, but requiring more selection.

MISCELLANEOUS VEGETABLES AT WISLEY, 1912.

AUBERGINE.

'Violette longue' (R. Veitch).—A good variety, of bushy habit, bearing medium-sized, dark violet-purple fruits.

'Violette naine tres Laitive' (R. Veitch).—The habit of this variety is similar to that described above, but although it flowered freely no fruit was produced.

BEAN.

Climbing French (R. Veitch).—A very strong grower, producing abundant growth at the base of the plants. Flowers white, tinged with violet-mauve; pods $6\frac{3}{4}$ inches long, straight, borne in good clusters. An excellent cropper.

DWARF BEAN.

'Early Favourite' (R. Veitch), **A.M.** April 27, 1897.—An excellent variety, strong and healthy in growth, foliage dark green, height 2 feet, flowers pale rosy-pink, pods 6 inches long, pale green, straight; crop excellent.

RUNNER BEAN.

'Masterpiece' (R. Veitch).—A very strong and vigorous grower; flowers with white wings and pale buff standards; crop heavy; pods handsome, straight, many measuring 10 inches in length.

'Prizewinner' (North-Row).—An excellent, strong, and vigorous grower and a very heavy cropper; sets freely and bears handsome, straight pods, often $9\frac{1}{2}$ inches long. Flowers scarlet.

BEET.

'Crimson Globe' (R. Veitch).—An excellent globular variety, of medium size.

CABBAGE.

'Crimson Pickling' (R. Veitch).—A useful pickling variety, of medium size, with good, firm, round hearts of deep crimson; outer leaves large, veined and suffused with crimson.

'MacKinlay's Matchless' (MacKinlay).—A good Cabbage, of conical shape, with compact, firm, solid heart. Comes into use very early.

CARROT.

'Early Gem' (Sydenham), **A.M.** September 26, 1911.—See vol. xxxvii. p. 565.

'Early Nantes' (Sydenham).—See vol. xxxvii. p. 565.

'St. Valery' (Sydenham).—See vol. xxxvii. p. 567.

PEA.

*1. Seedling No. 1 (J. K. King).—A very strong grower; height 4 feet; haulm light green; pods 3½ inches long, borne in pairs, containing 6-9 fair-sized peas in each; crop good; germination very good.

2. Seedling No. 2 (J. K. King).—Growth strong; haulm light green; height 5 feet; pods borne in pairs, 4¼ inches long, containing 8-9 very large peas in each; crop good and germination good. An excellent variety.

3. Seedling No. 3 (J. K. King).—Height 5 feet; haulm strong, light green; pods 4 inches long, borne in pairs, each containing 7-9 large peas; crop poor; germination good.

4. Seedling No. 4 (J. K. King).—This variety requires more selection. Height 3½ feet; haulm fairly strong, light green; pods 3½ inches long, containing on the average 8 good-sized peas; crop excellent; germination good.

5. Seedling No. 5 (J. K. King).—A good pea producing a splendid crop. Growth strong; haulm light green; height 6 feet; pods 4½ inches long, borne in pairs, containing about 9 large peas in each; germination good.

6. Seedling No. 6 (J. K. King).—Height 5 feet; growth strong; haulm light green; pods borne in pairs, each 4 inches long and containing 7-9 excellent peas; crop and germination good.

7. Seedling No. 7 (J. K. King).—A very handsome pea, growing 5½ feet high; haulm strong and light green; pods mostly single, 4½ inches long, containing 8 or 9 large peas; crop excellent; germination good.

8. Seedling No. 8 (J. K. King).—A good pea; height 3 feet; haulm strong, dark green; pods borne in pairs, 4 inches long, containing 6-8 large peas; germination excellent; crop very heavy.

9. Seedling No. 9 (J. K. King).—Another good variety producing a very heavy crop. Height 2 feet; haulm strong, dark green; pods 4 inches long, borne in pairs, containing 6-9 fairly large peas in each; germination excellent.

10. 'Best of All' (Sydenham).—Height 3 feet; haulm very vigorous in growth, dark green; pods 4½ inches long, borne in pairs, each containing 6 or 7 very large peas; crop good; germination fairly good.

11. 'Cimeter' (Holmes).—The stock of this pea requires a little more selection. Height 2½ feet; growth strong; haulm dark green; germination good; pods 5½ inches long, containing on the average 10 good-sized peas; mid-season.

12. 'Deep Green Early' (Holmes).—Height 2 feet; haulm very strong in growth, dark green; pods borne mostly in pairs, 4 inches long, containing 8 or 9 good peas; germination very good; crop heavy; early.

13. 'Early Marrow' (Holmes).—A very good cropper; height 4½ feet; haulm strong, light green; pods borne in pairs, 3½ inches long,

* See footnote p. 549.

each containing on the average 6 good peas; germination excellent. It is said to be earlier than 'Gradus.'

14. 'Exonian' (R. Veitch), **F.C.C.** July 1, 1887.—Height 3½ feet; haulm strong, light green; pods 3 inches long, containing 7 large peas; germination and crop good.

15. 'Glory of Devon' (R. Veitch), **A.M.** July 11, 1899.—Height 4 feet; haulm very vigorous in growth and dark green in colour; pods borne in pairs, 4½ inches long, each containing 8-10 good peas; germination very good; crop excellent.

16. 'Glory of Ross' (Holmes).—A good late cropper, but requires more selection. Height 4½ feet; haulm fairly strong, light green; pods mostly single, 4 inches long, containing 7 very large peas; germination good.

17. 'Goldfinder' (R. Veitch).—Height 5 feet; growth strong; haulm light green; pods in pairs, 3½ inches long, containing on the average 6 fairly large peas; a very vigorous grower and a good cropper; germination good.

18. 'James Holmes' (Holmes).—Height 18 inches; haulm strong, dark green; pods in pairs, 3½ inches long, containing 7 or 8 large peas. A second early variety; germination and crop excellent.

19. 'Logan Pea' (Sydenham).—A very vigorous variety bearing a heavy crop. Height 5 feet; haulm light green; pods 4½ inches long, containing 6-8 large peas; germination good.

20. 'Mainstay' (Holmes).—A good, handsome maincrop variety bearing an excellent crop. Height 3½ feet; haulm very vigorous in growth, light green; pods 5 inches long, containing 10 large peas; germination very good.

21. 'Perfection' (R. Veitch), **A.M.** July 14, 1897.—Height 3½ feet; haulm very strong, dark green; pods 4 inches long, containing 6-7 medium-sized peas; germination excellent; crop good, late.

22. 'Premier' (Bell & Bieberstedt), **A.M.** July 18, 1911.—Height 5½ feet; haulm strong, light green; pods in pairs, 4½ inches long, containing 9-11 large peas; germination excellent; maincrop.

23. 'The Clipper' (Sydenham).—Height 5 feet; haulm strong, light green; pods borne in pairs, 4½ inches long, containing on the average 9 large peas; germination fairly good; crop excellent. A good pea.

24. 'The Lincoln' (Bath).—A good cropper; height 2½ feet; haulm vigorous in growth, dark green; pods 4 inches long, containing 7-8 large peas; germination fairly good.

25. 'Warriston Wonder' (Bell & Bieberstedt).—A maincrop variety. Height 5½ feet; haulm very strong, light green; pods in pairs, 4¼ inches long, containing 7-10 good-sized peas; germination very good; crop heavy.

26. 'Western Express' (R. Veitch), **A.M.** July 11, 1902.—A very good cropper, growing 5 feet high; haulm fairly strong, light green; pods 4 inches long, containing 6-8 good-sized peas; germination good.

27. Seedling No. 20 (Kelway).—Sent in late; height 6 feet; haulm

dark green; pods single, 5 inches long, containing 7-10 large peas; a good cropper.

Edible Podded Pea (Solomon).—The seeds of this were obtained from China, and it appears to be the Giant Sugar Pea. Height $5\frac{1}{2}$ feet; leaves large, broad, light green with crimson markings where they join the stems, which are tinged with purple. Flowers mostly solitary; wings deep carmine-violet; standards bright violet, suffused with violet-rose. Pods soft and tender, $4\frac{1}{2}$ inches long, pale green, very much twisted, broad, containing 6-8 peas of large size. Crop fairly good.

RADISH.

'White Icicle' (R. Veitch).—A long, tapering, white root of good shape; crisp and of excellent mild flavour; amount of top growth medium.

SALSIFY.

'Sandwich Island' (R. Veitch).—An excellent variety of this useful vegetable.

SAVOY.

'All Head' (Heinemann).—A compact-growing variety producing long, firm, conical hearts of much crinkled leaves. It is of the 'Sugar-loaf Drumhead' type.

'Best of All' (Sydenham).—See vol. xxxvii. p. 576.

'Ne Plus Ultra' (Heinemann).—A variety of the 'Drumhead' type, with good medium-sized hearts and large glaucous outer leaves.

'Ormskirk Late Green' (Sydenham).—See vol. xxxvii. p. 578.

'Sixty Days' (Heinemann).—A good Savoy of the 'Drumhead' type, with pale green, large, firm hearts and coarsely crinkled outer leaves. The stock requires a little more selection.

'Vertus' (Heinemann).—A useful 'Drumhead' variety of large size; hearts firm; outer leaves large and much crinkled.

SHALLOT.

'New Golden' (J. Veitch).—A good variety having roundish bulbs of large size and of a reddish-brown colour.

'Veitch's Exhibition' (J. Veitch).—A good-sized variety of a chestnut-brown colour. Crop excellent.

TOMATO.

'Ailsa Craig' (Emptage), **A.M.** August 30, 1910.—See vol. xxxvi. p. 743.

'Autumn Dainty' (Chapman).—A prolific bearer of medium growth, with slightly corrugated, bright red fruit, borne in trusses of 8 or 9.

'Ayrshire' (Emptage), **A.M.** August 30, 1910.—See vol. xxxvi. p. 743.

'Carrick' (Emptage), **A.M.** August 30, 1910.—See vol. xxxvi. p. 743.

'Fillbasket' (Emptage), **A.M.** August 15, 1905.—See vol. xxxvi. p. 743.

Guyott's No. 1, 'Cornet' strain (Emptage).—A medium grower, with trusses bearing on the average 6 medium-sized, smooth fruits.

Guyott's No. 2, 'Cornet' strain (Emptage).—Similar in habit to the preceding, bearing slightly corrugated fruits in trusses of 6.

'Holmes' Supreme' (Emptage), **A.M.** August 5, 1905.—An excellent and very well-known variety of strong and vigorous growth. Fruits dark red, medium in size, smooth, borne in trusses carrying on the average 10 fruits.

'Northern King' (Barr).—A very vigorous and healthy grower, carrying on the average 8 large fruits of a dull scarlet colour to a truss. Crop heavy.

'Queen of Venice' (R. Veitch).—A strong-growing variety, with rather straggling trusses, carrying on the average 6 large, slightly corrugated, bright red fruits. Matures its fruit late. Crop good.

'Sunrise' (Emptage), **F.C.C.** July 4, 1905.—See vol. xxxv. p. 497.

All the above varieties made very healthy growth, and until the end of the season no disease of any kind was present.

Turnip.

Swede Turnip (R. Veitch).—A useful garden variety of this vegetable.

APPLIANCES, &c., TRIED AT WISLEY, 1912.

Grape Preserver (Taylor).—This bottle we consider a great improvement on those already on the market. It consists of a cylindrical glass vessel 3 inches in height, with a diameter of 1½ inch, thus having a capacity of about 4 fluid ounces. It is fitted at the open end with a rubber cap with a hole through which the stem of the bunch passes, this being held in position by passing through a hole in a zinc disc which fits at the bottom of the bottle. It is very compact and takes up no space beyond the width of the bunch. The water-holding capacity of the bottle is quite sufficient for most varieties, but should a fresh supply of water be required there is no difficulty experienced in refilling and no fear of spilling any water amongst the berries. In using the preserver we found that either a short-stemmed or a long-stemmed bunch could be preserved with equal success, and that it is best to give the stem two slanting cuts to allow it to pass more readily through the rubber. The stem must also reach the hole in the zinc so that the bunch may be kept in position when the water is low. The upper end of the stem is the more convenient to insert, as it does not take so much water to keep the berries plump when this end is inserted. The grapes stand well clear of the bottle, thus preventing all risk of the berries being rubbed by contact. It should prove a boon to those who are not fortunate enough to have a grape-room, for when cut the berries will keep well for a considerable time in the vinery, and the rods may be relieved of their bunches much earlier than otherwise possible without the above convenience.

New Patent Talley (Ward).—A nice label for exhibits but not strong enough for the rockery.

Patent Flower-pot (Vickerage).—We did not find plants do so well in this pot as they did in an ordinary flower-pot.

Patent Supports (Walters & Co.).—These consist of straight square iron rods of varying lengths with thin iron circular bands, drilled and screwed on to the upright with a thumb screw, inside of which the plant is trained. When used outside they are easily blown out of position, and we find the screws readily break during stormy weather.

Improved Demon Insecticide (Boundary Chemical Co., Ltd.).—A useful insecticide for washing and sponging when used according to instructions.

Folding Frame (The Folding Span Light Co.).—We found this frame too draughty and damp for propagating purposes.

Soluble Paraffin (Cooke).—An ideal preparation, pleasant to use, easily mixed, and giving the leaves a glossy and green appearance after use.

Xylonite Rose Labels (McNulty).—The coloured celluloid of which the labels are made soon fades in the sun, making the name indistinct and difficult to read.

Swanyck Label (Trevor).—This consists of a long wire support on the end of which hangs the wooden label. It slips on backwards from the bottom of the holder, and so cannot come off or be lost. The label being supported it is not splashed or disfigured by rain, &c., and the writing remains clear and distinct.

Lights for Protecting Rock Plants (Durham).—These lights would be greatly improved if the supports were made stronger. We find that a greater admittance of air is necessary than is provided, as moisture collects on the inside of the glass, causing young plants to damp off, the top and sides fitting too closely to allow air to circulate freely.

Tomato-plant Food (With's Chemical Manure Co.).—Not sufficient advance on other manures to call for special comment.

Carbon Universal Manure (With's Chemical Manure Co.).—A useful manure for Pelargoniums, carnations, and other pot plants.

Horticol (Hawker).—See Corvusine, vol. xxxvii. p. 580.

Climax Lawn Sand (Boundary Chemical Co., Ltd.).—Answers well for the purpose of killing weeds and moss in lawns and encouraging the growth of the grasses.

Soluble Petroleum (H. Morris).—A "soluble paraffin" which may be mixed with water in almost any proportions, and shows but slight inclination to separate out. Small quantities, however, in all strengths of solution separate on standing, and in use it is therefore very important to see that the mixture is agitated efficiently in the sprayer.

BOOK REVIEWS.

"Gardens for Small Country Houses." By Gertrude Jekyll and Lawrence Weaver. 4to. 260 pp. (Country Life, London, 1912.) 15*s*. net.

A most useful book for owners of comparatively small gardens, containing a great number of illustrations of gardens attached to houses of the value of £500 and upwards. The following remarks in the introduction are so true and important that we reproduce them: "In the arrangement of any site the natural conditions of the place should first be studied. If they are emphatic or in any way distinct, they should be carefully maintained and fostered. It is grievous to see, in a place that has some well-defined natural character, that character destroyed or stultified, for it is that quality that is most precious. Many a hill-side site, such as those on wild moorland, has been vulgarised by a conventionally commonplace treatment." How often we see this in gardens of all sizes, and how conservative we still are in our choice of trees and shrubs in making new gardens, such things as common laurels, privet, &c., occupying prominent positions that ought to be filled with really good flowering subjects, of which there is an endless choice for practically all or any soils. In this profusely illustrated book there are many plans that could be altered a little to make them suitable for a number of gardens, always studying the environment of the place and its fitness for the house; and we can strongly recommend it to anyone making a new garden or remodelling an old one, as it is full of ideas.

"Royal Gardens." By Cyril Ward. 4to. 182 pp. (Longmans, London, 1912.) 16*s*. net.

When we state that this book is illustrated with thirty-two full-page coloured plates and five pen drawings by the author, all admirably done, some idea may be formed of its beauty. The frontispiece is of "Daffodils on the Hill below the Round Tower, Windsor," making a splendid mass of colour, and showing how suitable these bulbs are for planting in grass on hillsides, where they always appear to advantage. There are other coloured illustrations of Windsor, especially the Norman Tower garden in April and June, and an interesting article by Mr. Arthur J. Hubbard. There are delightful views and scenes of Bagshot Park, the residence of the Duke and Duchess of Connaught, in May, with a very good article by Mr. C. W. Knowles, the head gardener there, and an illustration in colours of the lily garden is charming. Hampton Court in June is lovely, as many can testify who have seen it at that and other times of the year. The pen drawings of the Palace in the time of Queen Mary and the bird's-eye view of Hampton Court as finished by William III. will interest the reader.

Osborne, Marlborough House, Kensington Palace, Holyrood Palace, Claremont, and Sandringham are all illustrated in colour, and the articles written by the head gardeners at several of these places will add to the interest the pictures arouse. Not only are the gardens admirably illustrated, showing the designs and colours, but a most instructive history of each Royal residence is given as well. The whole book is full of fascinating matter, and is so well printed and illustrated that it will grace, we are sure, many bookshelves.

"Tulips." By the Rev. J. Jacob. 8vo. 116 pp. (Jack, London, 1912.) 1*s*. 6*d*. net.

We believe this is the only recent book on the tulip published in English, and we heartily congratulate Mr. Jacob on his work, as the labour and research on the chronology and bibliography alone must have been very heavy. Up to 1554 it appears that only two species, *Tulipa sylvestris* and *T. Celsiana*, were known in Mid and Western Europe, but towards the end of the same century tulips were introduced to England. In 1597, in the publication of Gerard's "Herbal," he says his "loving friend, Master James Gorrel, has been twenty years experimenting to find out the number of varieties [of tulips], all which to describe particularlie, were to rule Sisiphus stone or number the sandes." There are many other interesting dates and facts, including the period of the tulip mania in Holland, 1634-37, when fabulous prices were made, the history being continued up to 1910.

It is interesting to know that the Darwin type were first introduced into commerce by Messrs. Krelage, of Haarlem, in 1899, and though varieties of this class increase fairly rapidly, prices are now higher than they were a few years ago, proving how much appreciated they are. They will not stand forcing, but they are admirable for growing late in pots after other varieties similarly grown are over. All sections are described with faithful coloured plates; their culture under glass and outside is clearly given; their propagation, new varieties, the best varieties to grow, their diseases and pests, are all described in a masterly style. The book is well printed and furnished with a very good index.

"Indoor Gardening in Room and Greenhouse." By H. H. Thomas. 8vo. 152 pp. (Cassell, London, 1912). 1*s*. net.

Nearly everyone who can afford it possesses a greenhouse, and many others of smaller means go in for window-boxes, and for both this little book will be of great assistance, as it is thoroughly instructive, practical, clearly illustrated, and deals with every phase of greenhouse and indoor gardening.

"Fruit Growing for Beginners." By F. W. Harvey. 8vo. 124 pp. (Country Life, London, 1912). 1*s*. net.

With the annual increase of fruit consumed per head in this country any literature teaching how it may be grown to the greatest advantage

will be always welcome to the amateur, and in this little work we have it in a cheap, simple, and concise form, so that the novice can easily understand what to do. It is often remarked that we can buy fruit cheaper than we can grow it; that we question, but there can be no question that home-grown fruit is infinitely better in quality than purchased fruits, especially with soft fruits. The matter is well printed, the illustrations are good, and so is the index.

"The Rock Garden." By Reginald Farrer. 8vo. 118 pp. (Jack, London, 1912.) 1*s*. 6*d*. net.

All we need say on this book is that it is written in Mr. Farrer's masterly and attractive style, that it is well printed, beautifully illustrated, and thoroughly practical from cover to cover, dealing with all the best rock plants and how to grow them, and including the making and planting of a moraine. It should be read by all rock-garden lovers.

"Gardens in their Seasons." By C. von Wyss. 4to. 64 pp. (Black, London, 1912.) 1*s*. 6*d*.

A book for children about gardens and the living things found there, and we think they will like it. Coloured plates and black and white illustrations are alike excellent, and the language is simple and such as children, who nearly all like to hear about and see living things, will be interested in.

"The Story of our Trees." By M. M. Gregson. 8vo. xii+160 pp. (University Press, Cambridge, 1912.) 2*s*. 6*d*.

The authoress has produced an excellent guide to the nature study of trees suitable for the use of children about 12 to 14. It is cast in the form of lessons with directions for practical work and useful bold illustrations such as children of that age might be expected to make.

"Pflanzenphysiologie." By Dr. W. Palladin. Large 8vo. vi+310 pp. (Springer, Berlin, 1911.) Paper M. 8. Bound M. 9.

This text-book of plant physiology would well repay perusal by all gardeners and students of botany who can read German. The whole of this important branch of botany is ably dealt with and the plant as a living organism able to respond in many directions to external stimuli and capable of accommodating itself, within limits, to very varying surroundings, is the theme before the author's eye all through. A knowledge of plant physiology forms the main basis of all good plant growing, and every gardener worth his salt acquires a wide knowledge of it from the plants he deals with, though he may not be able to clothe his knowledge in technical language. If he had had the opportunity which exists now in so many directions, and not least helpfully, in such books as these, of gaining an accurate knowledge of the principles of his craft, how many a trying experience he might have been saved.

"Lehrbuch der Pflanzengeographie." By Dr. P. Gräbner. 8vo. viii + 303. (Quelle and Meyer, Leipzig, 1910.) M. 8.

The first third of this book deals with the relationships of plants, both fossil and present-day, such subjects as seasonal dimorphism, mutations, bud variations, methods of distribution and so on. The next seventy pages are devoted to a description of the characteristic floras of the various "floral regions," *e.g.*, the northern cold and temperate zones are considered under the sub-heads "Arctic Flora," "Sub-arctic region," "Woodland region of the northern cool temperate zone," "Mediterranean region," and "Steppe region," and so with the other parts of the globe. The last part of the book gives an account of the local distribution of plants (oecology). The author has thus brought together between the covers of one work an excellent review of the whole subject of Plant Geography—one that is of the most intense interest to everyone who desires to cultivate his plants intelligently.

"The Evolution of Living Organisms." By E. S. Goodrich, M.A., F.R.S. sm. 8vo. 108 pp. (Jack, London, 1912.) 6*d*. net.

One of the "People's Books," an excellent condensed account of the factors which have led to the evolution of existing forms, especially of animals from which group most of the evidence is drawn. The writing is for the most part clear and reasonably free from technical terms.

"The Flora of Bristol." By J. W. White. 8vo. ix + 722 pp. Map. (Wright, Bristol, 1912.) 13*s*. 6*d*. net.

This account of "the flowering plants and ferns that have been at any time found in the district of the Bristol coalfields," with sketches of "the topography, physical features, climate, &c.," notes on the origin of the flora, and "biographical notices of those botanists who have engaged in botanical research at Bristol during the past 350 years," has evidently been a labour of love to the author. That it has been a labour of time no one can doubt, for care has been taken to verify personally all doubtful records, including that delightful mistake of recognizing *Linnaea borealis* on a cricket pitch! (The plant turned out to be *Anagallis tenella*. Surely it must have been soft cricket played there!) The delights of botanical research into local floras are many, the outdoor field work, the searching of museums, the dipping into almost forgotten volumes, the intimate acquaintance one gains of the leisure occupations of long past naturalists, and the pleasant friendships made with present-day ones—the author has tasted them all, and has withal brought to bear a critical faculty which, perhaps, some enthusiastic botanists have lacked.

The result has been the production of an exceedingly good flora. The district includes the glorious Gorge of the Avon, whence still the Bristolians "sell the sublime and beautiful by the boatload," and where so many rare plants have their home; various geological formations are touched, and the seashore also lends its plants so that the district is

particularly rich. Three plates of plants peculiar to the district are given.

The book is well printed, carefully revised, and altogether of the best type of local flora.

"Oxford Gardens based upon Daubeny's Popular Guide to the Physick Garden of Oxford." By R. T. Günther, M.A. 8vo. xv + 280 pp. (Parker, Oxford, 1912.) 6*s*. net.

A history of the oldest Botanic Garden in the country was very desirable, and the author has searched old records assiduously in order to find the materials for it, for of *official* records there appear to be but few. Indeed, to judge from the author's preface, even of official recognition of the Garden as a University Institution there has been but little. After the history of the Garden follows an annotated list of the plants grown. We would suggest that before a second edition is published it would be well to compare the spellings of the plant names with an authentic list, and we hope the author will see his way to conform with the accepted convention with regard to the capitalization of the initial letter of certain specific names. Short, and surely quite incomplete, lists of fauna are also given. The concluding chapters deal with the gardens belonging to the various colleges, but here again the treatment seems rather unequal; certainly it seems inadequate as regards the beautiful and extremely interesting rock garden at St. John's College, built by the enthusiasm and personal work of the Bursar, Mr. Bidder. The trees all through Oxford come in for a considerable share of attention.

"A Text-book of Botany." By E. Strasburger, L. Jost, H. Schenck, and G. Karsten. Translated by Dr. W. H. Lang. 8vo. xi + 767 pp. (Macmillan, London, 1912.) 18*s*. net.

A text-book that has reached its tenth edition in Germany and its fourth in this country needs little else to recommend it. It has proved its right to a place, but the fact that it has been revised by competent men, so as to have been practically re-written in parts, ensures that it will maintain the high position into which its excellences have placed it. The greatest change is in the section dealing with vegetable physiology, to which 151 pages are devoted, and this is far more adequately dealt with than in the first edition. Coloured plates of a considerable number of the plants mentioned in the section on Classification are given.

"Plant Life." By Grant Allen. Revised edition, with an additional chapter by Professor G. Henslow. 8vo. 240 pp. (Hodder & Stoughton, London. 1912.) 1*s*. net.

"The Story of Wild Flowers." By the Rev. Professor Henslow. Revised and enlarged edition. 8vo. viii+257 pp. (Hodder & Stoughton, London. 1912.) 1*s*. net.

"Forest and Stream." By J. Rodway, F.L.S. 8vo. viii+204 pp. (Hodder & Stoughton, London. 1912.) 1*s*. net.

These are three books of the "Useful Knowledge Series." The first two deal with the forms and functions of plants, the last largely

with the influence of the forest on man and his affairs. All are well written, and each gives an interesting and readable account of the matter of which it deals.

"Nervation of Plants." By F. G. Heath. 8vo. vii + 187 pp. (Williams & Norgate, London, 1912.) 3*s.* 6*d.* net.

"This book is written more from the nature than the scientific point of view," the author says, but he hopes "it will . . . interest purely scientific readers." We fear he will be disappointed in his hope, and that the book will rather tend to irritate than interest the "purely scientific reader," unless his *forte* be psychology. One thing is, however, abundantly clear—that it must have given intense pleasure to the author to write the book. We must not criticize too severely, but we wish he had been able to see more of order and less of mystery in the way plants work. He might have written less of belief and more of those hardly-wrung facts which have been wrested by painstaking research into Nature's ways; he might have used terms such as "breathing" and "chlorophyll" in a more accurate manner. "Diastase," we see, is printed "diastaste" both in the text and in the index. Shorter sentences would frequently have made the meaning less "mysterious" and the book easier to read—we have just counted over 120 words in one sentence on p. 104.

"Wild Flowers as they grow." By H. Essenhigh Corke and G. C. Nuttall. Fourth Series. 8vo. viii + 200 pp. (Cassell, London, 1912.) 5*s.* net.

We have noticed the earlier series of these colour studies of wild plants with their descriptive letterpress as they have appeared. The present maintains the standard both in illustrations and text reached by the earlier ones, and such familiar plants as Blackthorn, Guelder Rose, Water Lily, and Stonecrop are dealt with, there being twenty-five coloured plates in all.

"The Circling Year." By W. P. Westell. 8vo. viii + 334 pp. (Nelson, London, 1912.) 6*s.* net.

If one desired a book on Nature in the country as a present for a child he might seek far and find none so sure to please as this. The text is interesting, and deals with just those things most likely to be met with in country rambles the year through. The illustrations in colour are striking and accurate, and the little pen drawings helpful in identifying "finds."

"Farm, Garden, and Birds." 8vo. 67 pp. (Royal Society for the Protection of Birds, London, 1912.) Paper covers, 1*s.*

Two prize essays dealing with the protection of crops from birds without killing them, and numerous supplementary notes on the same subject, are contained in this little pamphlet. To anyone interested in birds—and they compel the interest of all gardeners—a perusal of its pages will be of great service.

"Botany: Chapters on the Study of Plants." By G. S. Boulger. 8vo. viii + 120 pp. (Milner, Halifax, 1912.) 1*s.* net.

A capital chapter on the beginnings of botanical knowledge opens this useful little book. It deals with the work of the earlier botanists, and leads up to a consideration of the botanist's methods and to chapters on the life and distribution in time and space of British plants. It is a simple and accurate introduction to the study of plant-life.

"The Garden at Home." By H. H. Thomas. 8vo. xii + 276 pp. (Cassell, London, 1912.) 6*s.* net.

This is a plentifully illustrated book, some of the pictures being in colours, dealing with gardening in general but especially with the kind of plant to use for certain purposes in garden decoration. It is clothed in a somewhat gaudy cover, and there is perhaps a feeling of unrest about it as a whole that should certainly be absent from the home garden. It is not clear what kind of garden the writer has in mind in the planning of his book, for some of the illustrations show wide expanses of garden ground and other gardens in urban back yards. Many will be able to get hints, but few explicit directions, as to how to make a home garden, and yet the book seems to be intended for the beginner.

Here and there the author pleads for the use of the newest of plants, and complains that everyone plants the rose 'Dorothy Perkins' for instance. That is true, for what one sees everywhere and finds it gives him pleasure, that he desires to possess himself, but of course later he will wish to go further, and in this book he will find helpful hints as to how he may do so and notes on the newer forms that he should possess.

"Légumes et Fruits de Primeur." By Ad. Van Den Heede. 8vo. 226 pp. (Amat, Paris, 1912.) 3 fr.

One of the later chapters of this little book gives statistics showing the vast quantities of fruit and vegetables which annually pass from one European country into another and from the New World to the Old. The writer is specially interested in pressing upon French growers that there is no reason why they should have allowed themselves to fall so far behind their Belgian rivals as they have done in supplying the world's dessert tables, and he has put together in a handy form the results of the experience of all the most successful producers of early fruit and vegetables for their benefit. He gives a short history of forcing from the earliest mention of the practice by classical writers, a list of all the tropical fruits offered for sale at Covent Garden taken from the *Gardeners' Chronicle* with added comments and descriptions, and a further descriptive list of tropical food-producing plants which could be grown in France under glass. Though the author rather cavalierly dismisses the climate of our foggy islands as unsuited to the production of "Primeurs" even in heat, there is much in this book which might be useful to British gardeners; and one experiment, which he describes

as "amusing," where a tomato was grafted on to a rooted potato cutting and the combined plant produced tomatos above and potatos below, suggests possibilities for the amateur with the taste for curious experiment.

"The Story of My Rock Garden." By Reginald A. Malby. With Introduction by W. Irving. 8vo. 129 pp. (Headley, London, 1912.) 2*s*. 6*d*. net.

Mr. Malby is an enthusiastic grower of alpine plants, and in this book he describes very fully and lucidly his methods of cultivating successfully such plants in the neighbourhood of London. He certainly seems to have overcome the difficulties experienced in growing high alpines in the smoky atmosphere of the suburbs. Mr. Malby has used cement blocks in the place of stone, and he protects his plants in the winter by sheets of glass over them. This does not, of course, add to the attractions of a rock garden, but as it enables him to grow his plants, even some of the rarest and most difficult, quite successfully under adverse conditions, it is a mere matter of taste whether other people care to follow his example; but one thing is quite certain, and that is that to grow alpine plants in the murky atmosphere of London they must have overhead protection in the winter. Mr. Malby gives useful chapters on propagating and seed-sowing, which should prove of great use to the amateur, and his photographs of the plants growing in his garden are extremely good. Altogether, we consider this book on rock gardening a valuable addition to the many books on the same subject, and likely to prove of real use to those growers of alpine plants who do their own work and have a personal acquaintance with the plants they grow.

"Principles of Australian Agriculture." By W. C. Grasby, F.L.S. 8vo. xxv + 285 pp. (Macmillan, London, 1912.) 4*s*. 6*d*.

A well-written account of the principles of agriculture as applied to Australian conditions, copiously illustrated. If it could but be read and studied by all concerned it would put many on to a better road towards successful farming. It is written on no false basis of mistaken educative aim, for the author says, and says rightly, "Many a farmer has failed, not from knowing too much, but from doing too little. Cultivation of the mind is not a *substitute* for tillage of the soil."

"*Garden Life* Pictorial Guide to Gardening." By the Editor of *Garden Life*. 8vo. viii + 264 pp. (Cable Publishing Co., London.) 1*s*. net, paper covers.

A series of diagrams clearly drawn, with careful directions on how to do things in the garden. Propagation is especially well treated of.

"Heredity." By J. A. S. Watson, B.Sc. sm. 8vo. 94 pp. (Jack, London, 1912.) 6*d*. net.

This is a well-written account of our present knowledge of heredity with an exposition of Mendelism. The chapter on acquired characters

is an interesting one, most of the examples quoted being from animals, but one of a form allied to Shepherd's Purse occurring in Turkestan is particularly suggestive. A tall, white-flowered lowland form when transplanted to the highlands becomes dwarfer and has pink flowers like the corresponding highland form, but when the latter is removed to the lowlands it retains its alpine form.

"British Plant Galls: a Classified Text-book of Cecidology." By E. W. Swanton. Introduction by Sir Jonathan Hutchinson. 8vo. xv+287 pp. (Methuen, London, 1912.) 7*s.* 6*d.* net.

This is the most complete list of British galls hitherto published in England, and contains a considerable number of illustrations which will aid in making the nature of the gall more evident. A few galls recorded as British have not been included, but that is only to be expected in a work of this kind, for many of the records are buried in Transactions of various field clubs and so on, which would be almost impossible to consult except in the most complete libraries. As it is, the author has collected information from many sources, and the field naturalist owes him a debt of gratitude it will be difficult to repay. Some of the illustrations are coloured.

"A Monograph of the Mycetozoa: a Descriptive Catalogue of the Species in the Herbarium of the British Museum." By A. Lister. Second Edition, revised by Gulielma Lister. 8vo. 302 pp., 202 plates, 56 woodcuts. (British Museum, Natural History, 1911.) Price 30*s.*

The second edition of this well-known work has just been issued. *Mycetozoa* or *Myxomycetes* are organisms on the border-line between plants and animals, and though they are by several of those most competent to judge considered as animals, by general consent they are handed over to botanists, who place them as a special group below the Fungi. The first edition—published in 1894—aroused such widespread interest that large supplies of material came to hand from all quarters, and this led to the recognition of new forms, and to various taxonomic modifications.

The present volume incorporates these changes, and also the necessary alterations in nomenclature which arose in connexion with the "International Rules." A special feature is a very beautiful series of plates, more than half of which are coloured.

Miss Lister is to be congratulated on bringing the second edition to such a successful issue. The coloured plates are of great assistance, and as a systematic treatise the work is a model of accuracy and precision. We can safely say that no group of organisms included in the lower Cryptogams is in such good order for the botanist as the Mycetozoa.

"The Carnation Year-Book." Edited by J. S. Brunton. 8vo. 78 pp. (Horticultural Printing Co., Burnley, 1912.) 1*s.* 6*d.*

We believe this is the third year-book of the Perpetual Flowering Carnation Society, containing a list of members up to date, report and balance sheets, registered varieties, and some excellent articles on

the Carnation, by some of the leading authorities. A well-got-up little book.

"Fruit-farming: Practical and Scientific." By Cecil H. Hooper. 8vo. 130 pp. (The Lockwood Press, London, 1912.) 3*s*. 6*d*. net.

A great deal has been written and said about fruit-growing in Great Britain and Ireland, but of all the books we have read on the subject this is far and away the best and most instructive. The author's experience in America and this country, aided by keen observation, have given him special means of stating not only how much it costs to start fruit-farming, but the most approved methods of doing it too. Again, the author has been extremely fortunate in getting most valuable statistics from some of the most able fruit-growers in the kingdom, and from some of the best scientists of the day. If we take the first four chapters in the book it will be seen at once how useful the work is for intending fruit-growers—viz., The Training of the Fruit-farmer; The Capital Required in Fruit-farming; On the Selection of a Farm for Fruit-growing; the Setting-out of Fruit-plantations and Orchards. We have gone very carefully into these important questions, and we endorse all that Mr. Hooper writes. We are often asked what it costs to start a fruit-farm, and it is not always an easy question to answer, as local conditions play such an important part in the matter; but here Mr. Hooper deals with it in detail, placing a fair average price on the total cost, including cost of trees, digging, planting, fencing, manures, packing sheds, &c., &c. The lists of all the best varieties of each kind of fruit are very reliable, and will act as a guide to any intending grower. Manures, spraying, legal questions, compensation, packing, &c., are all most carefully written. We may add that the book is well printed and fully illustrated.

"Japanese Gardens." By Mrs. Basil Taylor. 8vo. 298 pp. (Methuen, London, 1912.) 21*s*. net.

The Japanese garden always possesses a fascination peculiarly its own, especially if all the subjects therein are Japanese, but frequently we find trees and shrubs in such gardens made in this country that are far from being Japanese at all. The illustrations by Mr. Tyndale in this book are beautiful, and show the exceeding great taste of the Japanese in their effects and general arrangements, and we believe that this particular form of horticulture might be copied still more by us in the future, as practically all the trees and shrubs grown in Japan in the open are equally suitable for our climate. The book is admirably printed, written in an interesting and instructive style, and worthy of a place on every garden-owner's shelves.

"Hardy Perennials and Herbaceous Borders." By Walter P. Wright. 8vo. 304 pp. (Headley Brothers, London, 1912.) 12*s*. 6*d*. net.

A beautiful book, profusely illustrated, well printed, and well written; practically every phase of gardening in which these plants can be employed is dealt with in Mr. Wright's well-known style.

"The Hardy Plant Year-Book, 1912." By A. J. MacSelf. 8vo. 51 pp. (Horticultural Printing Co., Burnley, 1912.) 1*s.* 3*d.*

The first year-book of the Hardy Plant Society is very creditable, containing a great deal of serviceable information of general interest to the hardy plant-grower.

"The Cult of the Coconut." 8vo. 112 pp. (Curtis Gardner, London, 1912.) 2*s.* 6*d.* net.

The arrangement of the matter in this book is disjointed and suggests a compilation of ill-assorted notes; for instance, it is necessary to read through forty-four pages before arriving at a description of the plant with which the book professes to deal. The style in which the book is written is reminiscent of company-promoting literature of the "journalese" of the evening halfpenny newspaper type. The free use of display type and marginal markings further emphasizes this resemblance. Despite its title there is very little about the actual cultivation of the Coconut Palm, but much about the superiority of the German merchant when compared with his English confrère. There is no mention of the fungoid diseases and injurious insects that attack the Coconut Palm, and only the slightest reference to the important subject of manuring, and none whatever to the kinds of manure to be employed. The latter part of the book treats of the West African oil-palm (*Elaeis guineensis*), the botanical name of which is wrongly spelt, and reference is also made to other oil-yielding seeds. The most valuable feature of the book is the illustrations, which are excellent.

"Botany, or the Modern Study of Plants." By Dr. M. C. Stopes. sm. 8vo. 94 pp. (Jack, London, 1912.) 6*d.* net.

This, one of "The People's Books," is a brief outline of the present-day attitude of workers in the different branches of Botany to their subject. It is well got up, but here and there needs reading with discretion, as, for example, at page 86, where it is said a flower "is so like the violets that it must not be put in the genus *Viola*," where the exact opposite is intended.

"The Alpine Flora." By H. Correvon and P. Robert. Translated by E. W. Clayforth. 8vo. 436 pp. (Methuen, London, 1912.) 16*s.* net.

About half this excellent work on the flora of the mountains is occupied by charming and accurate studies in colour of mountain flowers, usually very well reproduced. The rest not only describes the more common or striking mountain plants, but tells how they may be cultivated to gain their fullest beauty.

The talented author, whose devotion to alpine flowers and flower-growing is second to none, is well known to all lovers of alpine gardens in Great Britain, and his ideas on alpine-garden making as set forth here, with his confessions of former errors and his final judgment of what is fitting, will be given the weight they deserve. His praise

of British alpine gardens is not scant, nor should his ideas of how they should be made be difficult to follow from this book. Some of his plans for making alpine plants at home in our gardens are well known in this country, but one perhaps, the use of sphagnum as a rooting medium, is not often practised. In certain districts it may, perhaps, be used with advantage, though there are few localities in England so generously favoured with bright sunshine over long periods as to render its use so imperative as it probably is near Geneva, but such points as these the author makes clear. The descriptions are usually adequate, provided one has a general knowledge of botany, and are not entirely confined to technical outlines, but touch too the alleged medicinal values of the plants and their peculiar habits, as well as their peculiar beauties. Indeed, the last sometimes provoke not only poetic quotations but original poetry from the author.

The illustrations have a character of their own and express the individuality of the plants in a way none but a true artist could approach. They are not impressionist pictures such as one sees too many of, nor floral diagrams, but recognizable portraits in colour, unobscured by surroundings of other plants, but silhouetted on a specially chosen background.

It is not only a pleasing but a valuable book.

"The Small-Holder's Handbook." Edited by W. M. Elkington. Contributions on Gardening by Mr. W. D. Drury. 8vo. pp. 252. (L. Upcott Gill, London, 1912.) 3*s*. 6*d*. net.

We regret we have found nothing valuable in this book except a brief note in the preface that "it is obvious that intensive cultivation entails keen concentration on the part of those engaged in it, and small-holders need to be well equipped with practical knowledge." Sixty pages are devoted to gardening matters, and with much to confuse we have found little to amplify this assumed fundamental practical knowledge. The small-holder is recommended to rely on four apples, which by a curious misprint are made to suggest an annual supply, Lane's 'Prince Albert' being in season from September to March and 'Newton Wonder' from March to September! If he has a greenhouse 15 feet wide he is told to grow only two rows of tomatos in it, one on each side of the path, and no mention is made of the possibility of securing crops of chrysanthemums and sweet peas or lettuces, rhubarb, &c., during the six months of the year when the tomatos require no space in it. For rhubarb we are recommended to trench the ground 2 feet deep and plant the crowns 6 feet apart each way. These are samples of what we may term the positive defects of the book. On the negative side we note the omission of anything illuminating on intercropping, manuring,* catch cropping, successional cropping, and the economical and productive working of land. But it is just the knowledge of these things that adds butter and jam to the

* Except an occasional one ounce to the square yard sort of thing.

holder's hard-earned crust. The book will do less harm to the amateur.

"Elements of Agriculture." By the late W. Fream, LL.D. Edited by J. R. Ainsworth-Davis, M.A. xvi + 692 pp. (John Murray, London, 1911.) 5*s*. net.

This is the eighth edition of a well-known text-book which has again been brought up to date. The revision has been done by some of the best recognized authorities in the kingdom, supervised by the Principal of the Royal Agricultural College. Probably no other English book of its size gives such a comprehensive view of every branch of farming as this, and as such it is of special use to students and others desirous of gaining a sound preliminary knowledge of general farming before making a detailed study of any one of its varied branches. We heartily compliment the R.A.S.E. on the revision of this work, which well merits the success which it will certainly gain.

"The Standard Cyclopedia of Modern Agriculture and Rural Economy." By many authors. Edited by Professor R. Patrick Wright. Vol. xii. 8vo. xii + 245 pp.; with plates, figs., and a model. (The Gresham Publishing Company, London, 1911.) 8*s*. net.

The last volume of this important work. Like its predecessors it contains many extremely valuable articles by well-known writers. To be of great use it is necessary for a reader to have easy access to all the twelve volumes at the same time, because there are so many cross-references. We have previously drawn attention to the urgent need of a good index, and now that the whole twelve volumes are published we are quite convinced of the necessity, especially for those who would make the utmost use of the work as students, teachers, or practical growers. To give one concrete example, we were studying a valuable note on the chemical changes involved in storing farmyard manure. Our attention was for the time diverted, and the book was put away, the heading was forgotten in the interest aroused respecting the subject. Later, wishing to continue the study, various probable articles in different volumes were looked up before it was found, not under M (Manure), F (Farmyard manure), but under W (Winter manuring). We advise the publishers to ascertain from their known subscribers the desirability of a good index, giving with the inquiry an intimation of the lowest possible price of such index. If an index be ultimately forthcoming we shall most heartily recommend the work as a whole.

"Sylviculture in the Tropics." By A. F. Broun. 8vo. xvi + 309 pp. (Macmillan, London, 1912.) 8*s*. 6*d*. net.

This book, we are told in the preface, was originally intended to form one of a series on Agriculture in the Tropics, but on the original scheme for the series being abandoned it was published as an independent work.

The author was formerly in the Indian Forest Service, and also

Conservator of Forests in Ceylon; lately he was Director of Woods and Forests under the Sudan Government. It follows, therefore, that with regard to the countries in which he has seen service he is able to speak from personal knowledge of the climatic and other conditions therein prevailing, but owing to the wide scope covered by the title of the book he acknowledges indebtedness to other authors for information relating to other tropical countries. The primary duty of the forester in the Tropics is to arrest the decline of the forests and to improve them so as to render them of greater utility. To effect these results a thorough understanding of the factors underlying the proper development of tree growth is essential, and it is with a view to imparting a knowledge of these factors that this work has been written. The book is divided into four parts, under the following sub-headings: (1) Factors governing and influencing the existence of forests; (2) the formation and regeneration of woodland crops; (3) training and improvement of forest; and (4) special measures of maintenance and protection.

The exact influence that forests have on climate is a subject on which "doctors differ"; but there are other points on which all are agreed, not the least important being that forests exercise an influence for good in preventing erosion, and this is of great importance in tropical countries, where rainfall is heavy and floods frequent. There is no doubt that the indiscriminate destruction of tropical forests for purposes of temporarily cultivating the cleared areas is largely responsible for creating sandy and barren wastes that are frequently met with in the East. Also in countries such as India, where famines are liable to occur, forests play an important *rôle*. During times of scarcity the opening of forest reserves have been the means of providing food for sustaining both man and beast, and by this means thousands of lives have been saved.

Although primarily intended for students of tropical sylviculture, the book is not without interest to the general reader who is interested in the subject, and foresters in temperate climates might read certain chapters with profit.

"Himalayan Journals." By Sir Joseph Dalton Hooker, K.C.S.I., C.B., M.D., D.C.L., F.R.S. xxxii + 574 pp. (Ward, Lock, London, n.d.) 3*s*. 6*d*.

The late Sir Joseph Hooker, whose death in December 1911 closed a long and remarkable life, had accompanied Ross as assistant surgeon and botanist in the *Erebus* on his expedition to the Southern Seas, during which voyage he visited New Zealand, Australia, Tierra del Fuego, the Falkland Islands, and St. Helena. His Indian journey was commenced in 1847, and the fascinating account of the two years spent in botanical explorations in the Sikkim and Nepal Himalayas, and in travel in Eastern Bengal, Chittagong, and Silhet, is embodied in the "Himalayan Journals," which first appeared in 1854. An edition of this "Journal" is just now very apposite. The botanical results of his journeys were immense, and our gardens to-day owe

much to them from the fact that by them the magnificent Himalayan rhododendrons were first made known. But the "Journal" is something more than a mere account of the botany of the country: it contains numerous interesting observations on the people, their manners and customs, on the birds and insects that attracted the attention of the traveller, as well as on the geography and geology of that part of the wonderful Himalayan region which at that time was practically unknown. From the first the "Journal" took a high place amongst travel classics; but as originally published it was an expensive work, and therefore beyond the reach of the general reader who had not access to a good library. The moderate price of the present edition places it within the reach of all readers of this class of literature, and the fact that it contains reproductions of the original illustrations (most of them from drawings by the author) adds greatly to its value. The only abridgment is the omission of some of the appendices which contained matter of purely scientific interest.

Although books of travel are numerous nowadays and are produced in constantly increasing numbers, there are a few of outstanding merit, such as the "Himalayan Journals," Darwin's "Voyage of the *Beagle*," and Wallace's "Malay Archipelago," which will continue to be amongst the most cherished books in the possession of the student of science.

"Annuals, Hardy and Half Hardy." By C. H. Curtis. 8vo. xi + 116 pp. (Jack, London, 1912.) 1*s*. 6*d*. net.

It is difficult to write a book on annuals which is more than an annotated catalogue, but the author has done his best in the present instance along these lines. The usefulness of the annuals in the garden is frequently overlooked, and this little well-illustrated and very comprehensive book should do much to interest lovers of their gardens in these plants and to increase their cultivation.

"Planters' Note Book." By R. Woodward, Jr. 8vo. 126 pp. (*Gardeners' Chronicle*, London.) Limp cloth. 1*s*.

This is a little book for noting the dates and particulars of planting of new-comers to the garden, with ample space for the purpose. Conscientious note-taking of this description would not only add to the pleasure of the garden to oneself but leave a number of useful observations for others who follow.

BOOKS PRESENTED, PURCHASED, OR REVIEWED DURING THE YEAR 1912, AND DEPOSITED IN THE LIBRARY.

1 = Purchased.
2 = Sent for Review.
3 = Presented by Dr. B. Daydon Jackson, F.L.S.
4 = ,, ,, The Commissioner of Agriculture for the West Indies.
5 = ,, ,, Lady Hanbury.
6 = ,, ,, the Rev. W. Wilks, M.A., V.M.H.
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15 = ,, ,, La Société Nationale d'Horticulture de France.
16 = ,, ,, the Indian Government.
17 = ,, ,, Monsieur L. P. Simirenko.
18 = ,, ,, J. W. Anderson, Esq.
19 = ,, ,, Sir William T. Thiselton-Dyer, K.C.M.G., F.R.S.
20 = ,, ,, the Director Royal Botanic Gardens, Kew.

Abbreviations.—il. = illustrations; pl. or pls. = plates; col. pl. = coloured plates; frontis. = frontispiece; port. = portrait; enl. = enlarged; coloph. = colophon; pref. = preface; rev. = revised.

ABERCROMBIE, J. The British fruit-gardener; and art of pruning . . . and full directions concerning soils, situations, and exposures. London, 1779. 8vo. (1)

—— The gardener's pocket journal, and daily assistant in English gardening, with a treatise on drawing-room gardening, Wardian cases, aquariums, and fern-culture, by G. GLENNY. 35th ed. London, 1857. 1 pl. 12mo. (1)

—— A general system of trees and shrubs. London, n.d. 4to. (1)

AGAR, M. Garden design in theory and practice. London, 1911. il. pl. col. pl. 8vo. (2)

AITON, W. Hortus Kewensis; or, a catalogue of the plants cultivated in the Royal Botanic Garden at Kew. London, 1789. 3 vols. 13 pls. 8vo. (1)

ALLGEMEINES Teutsches Garten-Magazin oder gemeinnuetzige Beitraege fuer alle Theile des praktischen Gartenwesens. vol. 1-8. Weimar, 1804-11. pls. col. pls. 4to. (1)

[*continued as*]

Fortsetzung des Allgemeinen Teutschen Garten-Magazins. . . . vols. 1-8. Weimar, 1815-24. pls. col. pls. 4to. (1)

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BATH, Messrs., Wisbech. Pea (see p. 578); potatos (see p. 565); Viola 'Royal Blue' (see p. 285).
BAYLDON, Mrs., Dawlish. Seeds of shrubs (to be sown); plants of scarlet Eucalyptus and *Lagerstroemia indica* (growing on).
BEES, Messrs., Liverpool. Collection of new Chinese plants. Growing on.
BELL, J., Evanton. Melon. See p. 561.
BELL & BIEBERSTEDT, Messrs., Leith. Peas. See p. 578.
BENNETT-POË, J. T., M.A., V.M.H., Cheshunt. Collection of Daffodils. Planted in garden.
BOND, Rev. C. G. O., Farnham. Seeds from Nigeria. Plants raised and growing on.
BOWLES, E. A., M.A., F.L.S., Waltham Cross. Plants for the rockery. Cuttings of *Buddleia salvifolia.* Growing on.
BOYCE, J. W., Welney. Potatos. See p. 565.
BRADLEY, A., Totley. Violas. See p. 276.
BRADSHAW, Mrs., Merrow. Alpines. Planted on rockery.
BRASSEY, Hon. Mrs., Heythrop. Seeds. Plants raised.
BREADMORE, C. W., Winchester. Seeds of Antirrhinums, peas, and turnips. For trial.
BRYANS, Mrs., Woodmansterne. *Juniperus tamarixifolia.* Planted on rockery.
BUNYARD, Messrs., Maidstone. Plants for the rockery.
BURPEE, Messrs., Philadelphia. Tomatos. To be tried 1913.
BURROUGHES, T. H., Stamford. Seed of *Gentiana lutea.* For distribution 1913.
BUTZ, E., Enfield. Plants of Rose 'Heinrich Munch.' Growing on.
CAMBRIDGE BOTANIC GARDEN. Collection of seeds. Plants raised for distribution.
CAMPBELL, A., Pannal. Plants for rockery.
CARTWRIGHT, Mrs., Send. *Alyssum saxatile.* For distribution.
CHAMBERS, Miss, Fishguard. Seeds from Cashmere. Plants raised.
CHAPMAN, F. H., Rye. Tomato 'Autumn Dainty.' See p. 580.
CHELSEA PHYSIC GARDEN. Collection of seeds. Plants raised for distribution.
CHENNELL, P., Dorking. Cucumber 'Chennell's Challenger.' See p. 576.
CLOSE, Miss, Woodstock. Calceolaria seed. Failed to germinate.
COOKE, S., Glasgow. Soluble Paraffin. See p. 582.
COOPER & NEPHEWS, Messrs., Berkhamsted. Summer and winter sprays; weedicide. For trial.
COPE, S. R., Westminster. Cotton and coffee seeds. Plants raised.
CRACOW BOTANIC GARDEN. Collection of seeds. Plants raised for distribution.
CRAFTON, Mrs., Egypt. *Iris Sisyrinchium.* Growing on and flowered.
CRESSWELL, Mrs., Ewhurst. Journals for Library.
CRESSWELL, G. C. Baker, Alnwick. Plants for rockery. Seed of *Meconopsis paniculata.* For distribution 1913.
CRO, Mrs., Streatham Common. Seeds. Not yet germinated.
CROWFOOT, W. M., Beccles. *Jacaranda ovalifolia* (growing on); *Bulbophyllum recurvum* (added to collection).
CRUICKSHANK, Mrs., Horsell. Seeds of white *Antigone.* Plants raised, planted in garden.

CUMMING, L., Rugby. *Karatas Carolinae.* For distribution 1913.
CUTBUSH, Messrs., Highgate. Plants for rockery.
CUTHBERTSON, M., Rothesay. Violas. See p. 275.
DANIELS, Messrs., Norwich. Potatos (see p. 565); strawberries (growing on).
DAVIDSON, Miss, Warnham. Cape Pelargoniums. Growing on.
DEAN, A., V.M.H., Kingston. Books for Library.
DE COURCY, F. A., Somerset East, South Africa. Seeds of *Agapanthus* (plants raised); other seeds (growing on).
DICKINS, C. S., Horsham. Gladioli, Sparaxis, and Phormium. Planted in garden.
DICKSON, Messrs., Newtownards. Violas. See p. 275.
DICKSON & ROBINSON, Messrs., Manchester. Melon. See p. 561.
DIXON, Miss, Edenbridge. Viola 'Mauve Queen.' Growing on.
DOBBIE, Messrs., Edinburgh. Sweet peas (see p. 271); potatos (see p. 565); Cape Pelargoniums (growing on); violas (see p. 275); dahlias (see p. 556); bedding Pelargoniums (see p. 549); violas (growing on); roses (growing on).
DROVER, Messrs., Hurstpierpoint. Seed of Tomato 'Hurst Marvel.' To be tried 1913.
DU CANE, Lady, Witham. Cowslip and Dianthus. Planted on rockery.
DUNFORD, G., Ilford. Lawn brooms. For trial.
DURHAM, F. R., A.M.I.C.E., Salcombe. Protecting frame for rock plants (see p. 583); seed of *Pittosporum nigrescens*; *Romneya Coulteri* (planted in garden).
EARLE, Mrs., Cobham. Plants for the garden.
EDWARDS, Mrs., Llangollen. Collection of Saxifrages, &c. Planted on rockery.
ELEY, T. G. H., Furness Abbey. Seeds of *Dimorphanthus mandschuricus* (plants raised); *Scolopendrium lonchophorum* (planted on rockery).
ELLIOTT, C., Stevenage. *Saxifraga Burseriana* 'Gloria.' Planted on rockery.
EMPRESS BOTANICAL GARDENS, Poona. Seed of *Beaumontia grandiflora, Delphinium dasycaulon.* Plants raised. Growing on.
EMPTAGE, W., Herne Hill. Tomatos. See p. 580.
ERITH, Mrs., Sutton. Seeds from Argentine. Plants raised.
EVANS, C. H., Mumbles. Violas. See p. 276.
FAIRCHILD, D., Washington. Seed of *Sequoia washingtoniana.* Sown.
FAUDEL-PHILLIPS, B. S., Hertford. *Lobelia cardinalis.* Planted in garden.
FLETCHER, H., Annesley. Potatos. See p. 565.
FLETCHER, H. M., Loughton. Foxglove. Planted in garden.
FORBES, Messrs., Hawick. Flower seeds (see p. 555); seed of *Lobelia cardinalis* (plants raised); violas (see p. 275).
FOX, Mrs., London. Gold and silver carp for the pools on the rockery. Plants of *Acaena.* Planted on rockery.
FROST, J. M., M.P., Chester. *Aubrietia* 'Lavender.' Planted on rockery.
GATHERCOLE, G., London. Lawn sprinkler.
GERAHTY, C. E., Pyrford. Seeds of white *Daphne Mezereum,* and other shrubs (sown); plants of *Clerodendron tricotomum,* Canadian Elder, &c. (planted in garden).
GIBSON, H. A., Wedmore. *Anchusa italica* 'Dropmore' var. Planted on herbaceous border.
GILBERT, Messrs., Bourne. Plants of sweet pea 'Mrs. R. Gilbert.' See p. 273.
GILES, Miss, Bonchurch. *Acanthus mollis.* Planted in garden.
GILLIAT, Mrs., Rickmansworth. Fig trees. Growing on.
GLASHEEN, J., Hungerford. Melons. See p. 561.
GLYN, Lady, Wimborne. Alpines. Planted on rockery.
GODFREY, Messrs., Exmouth. Cape Pelargoniums. Growing on.
GOODDEN, Mrs., Yeovil. *Myosotis Rehsteineri.* Planted on rockery.
GORDON, R., Brockham Park. Journals for Library.
GREAVES, Miss, Reigate. Ferns. Planted on rockery.
GREEN, H., Maidstone. Seed of scarlet mistletoe. Sown on trees in garden.
GREET, C. H., Norham. Seeds from India and British East Africa. Plants raised and growing on.
GREGSON, Mrs., Cranleigh. *Dracaena.* For distribution.
GRIER, R. M., Barrhead. Viola 'Rev. Wm. Young.' For trial.
GRIEVE, Mrs., Chalfont St. Peter. *Artemisia gnaphaloides.* Planted on herbaceous border.
GUILDFORD HARDY PLANT NURSERY, Guildford. *Spiraea gigantea rosea.* Planted in bog garden.
HALES, W., Chelsea. Seeds of *Welwitschia mirabilis.*
HANBURY, Lady, Ventimiglia. Collection of seeds. Plants raised for distribution.

HARDY, A. F., Bishop's Waltham. Seeds of *Pyrus ussuriensis*. Plants raised.
HARRIS, F. L., Dorking. Seedling plants for rockery.
HARVEY, F. S., Hayle. Bulb from Transvaal. Growing on.
HAWKER, A. E., London. Tin of 'Horticol.' See p. 582.
HEINEMANN, F. C., Erfurt. Cucumbers (see p. 576); savoys (see p. 580).
HEISCH, E., Stanmore. Seeds of bean from New Zealand.
HENDERSON, Sir George, Otford. Seeds of *Nannorhops Ritchieana* (plants raised); cuttings of seedless grape (growing on).
HENSIGNES, Mrs., Guildford. *Petasites* (planted in bog); Cape Pelargonium (growing on).
HOBBIES, Messrs., Dereham. Roses. Planted in garden.
HOGG, S. J., London. *Primula Allioni*. Planted on rockery.
HOLMES, E. M., Sevenoaks. Seeds. To be sown.
HOLMES, W. G., Tain. Peas. See p. 578.
HOOPER, Miss, Guildford. Seeds. Plants raised.
HOSKYNS, A. P., Dorking. *Primula capitata*. Planted on rockery.
HUDSON, J., V.M.H., Acton. *Cymbidium Tracyanum* (added to collection); Cuttings of *Phyllocactus* (growing on).
HUMMELBERGER, J., Vienne. Seed of Lettuce. See p. 577.
HUTTON, Rev., Falkirk. Cuttings and plants for the rockery.
ICETON, W., Putney. Seeds of *Crossandra undulaefolia*. Plants raised.
JARVIS, Miss, Walton. Copies of R.H.S. Journals. Added to Bothy Library.
JEFFERY, Mrs., Lee. *Asphodeline lutea*. Planted in garden.
JEKYLL, Miss, V.M.H., Godalming. *Helleborus corsicus*. Planted in garden.
JEYES' SANITARY COMPOUNDS Co., London. Summer, winter, and nicotine washes. For trial.
JONES, Messrs., Lewisham. Bedding Pelargoniums. See p. 549.
KELWAY, Messrs., Langport. Peas (see p. 578); berries (growing on).
KEW, ROYAL BOTANIC GARDENS. Collection of seeds. Plants raised for distribution.
KING, Messrs., Coggeshall. Peas (see p. 578); sweet peas (see p. 274).
LAWRENCE, Sir Trevor, K.C.V.O., V.M.H., Dorking. Seeds of *Aethionema grandiflorum*, *Hunnemannia fumariaefolia*, *Oxypetalum coeruleum*, Pentstemon (Lemoine's hybrids), giant Lobelia, *Paeonia Veitchii*. Sown.
LAXTON, Messrs., Bedford. Laxtonberry (growing on); Strawberry 'King George V.' (growing on); other strawberries (growing on).
LEMBERG, Botanic Garden. Collection of seeds. Plants raised for distribution.
LEON, Dr., Torquay. Plants for rockery.
LESLIE, Messrs., Carlisle. Violas. Growing on.
LETTS, S., Long Buckley. Potato. See p. 565.
LEVY, J. A., Maidenhead. Seeds of Melons. See p. 561.
LLOYD LAWRENCE, Messrs., London. Lawn mower, lawn cleaner, and wheel hoe. For trial.
LODER, G. W. E., Ardingley. Pines. Planted in garden.
LONGSTAFF, Mrs., Wimbledon. Orchid and unnamed plant. Growing on.
LOVETT, E., Croydon. Sempervivums. Growing on.
LYONS, Botanic Garden, France. Collection of seeds. Plants raised for distribution.
MACDONALD, J., Harpenden. Collection of grass seed. Growing on.
MACPHAIL, J., Stoke-on-Trent. Violas. See p. 275.
MAGOR, E. J. P., St. Tudy, R.S.O., Cornwall. Seedlings of :—Wilson's birches; Carpinus sp.; Crataegus sp.; *Rhododendron ciliatum; Rhododendron lutescens;* various Rhododendrons and Forrest's Cotoneaster; Picea; *Rhododendron irroratum;* other Chinese Rhododendrons; *Rhododendron Delavayi*, Cotoneaster, and Rhododendrons. Seeds of *Tricuspidaria lanceolate* and *Primula Veitchii*. All growing on.
MARRISON, H., Stockport. Viola 'Mrs. Marrison.' See p. 283.
MARSHALL, W., V.M.H., F.L.S., Bexley. *Nephrolepis todeaoides*. Growing on.
MARYON-WILSON, Miss, Blackheath. Seeds from New Zealand and India. Plants raised.
McCATTELL, J., Addlestone. Seed of *Butea frondosa*. Sown.
McNULTY, J., Ormskirk. Xylonite Rose labels. See p. 583.
METCALFE, W. P., Oxted. Primulas for the rockery.
MILLARD, Mrs., Winchfield. Seeds of '*Pepo cucurbita*.' See p. 572.
MILLER, G. W., Wisbech. Plants for rockery.
MILNER, W. A., Sheffield. *Meconopsis integrifolia*, *Primula Bulleyana*, *Primula Cockburniana* (planted on rockery).
MORTER, W. H., Birmingham. Violas. Growing on.

MOWLL, Dr., Surbiton. Seeds of Alpines. To be sown.
NORTH-ROW, W., Tiverton. *Rubus phoenicolasius* (planted in garden); seeds (plants raised); Bean 'Prize-winner' (see p. 575); aster 'Unicum,' and grass from Iceland (planted in garden); Violets (planted in garden).
NUTTING, Messrs., London. Melon (see p. 561); marrows (see p. 572).
OGILVY, Mrs., West Byfleet. *Eritrichium nanum.* Growing on.
PACKE, Miss, Asherne. *Hedychium Gardnerianum.* Growing on.
PALMER, A. E., Derby. Viola 'Palmer's White.' See p. 284.
PAUL, Messrs., Cheshunt. *Viola gracilis* 'Mrs. Bowles.' Planted on rockery.
PETERS, W., Leatherhead. Strawberry 'Olympia,' Vine 'Norbury Park Seedling.' Growing on.
PICKERING, Rev. J., Ashburton. Potatos. See p. 565.
PIRIE, D. V., Kinellar. Seeds. Sown.
PITHER, Messrs., Uxbridge. Mushroom spawn. To be tried.
PRICE, Dr., Teneriffe. Seeds. Sown.
RAIKES, Mrs., Chertsey. *Rosa rugosa* (double form). Planted in garden.
RENDLE, Dr., British Museum. Seed of *Senecio Kleinia.* Plants raised.
RICKARDS, R. W., Usk Priory. *Cheiranthus mutabilis,* Keeley's var. Planted on rockery.
ROBINSON, Messrs., West Bromwich. Clift's Fluid, Scalin, Pine spray. To be tried.
ROSS OF BLADENSBURG, Lt.-Col. Sir John, Rostrevor. Seeds. Sown.
ROWLANDS, Messrs., Liverpool. Melon 'John Massey.' See p. 561.
ROYAL GARDENS, Sophia, Bulgaria. *Rivea hypocrateriformis.* Growing on.
RUDD, C. D., London. Seeds of Campanulas and Primulas for rockery.
SANDEMAN, Lt.-Col., Havant. Seed of *Leucadendron argenteum.* Plants raised. Collection of seeds. To be sown.
SANDER, Messrs., St. Albans. *Dendrobium superbiens;* collection of Dendrobiums (12 varieties); *D. Findlayanum; D. formosum giganteum.* All added to the collection.
SANDS, W. E., Hillsborough. Potatos. See p. 565. Also varieties to be tried 1913.
SCOTT, Messrs., London. Loam for trial.
SECRETAN, Mrs., Weybridge. Seeds of *Physianthus albens.* Plants raised.
SHIRLEY, Rev. W., Southampton. Iris seeds. To be sown.
SIBPUR, BOTANIC GARDEN, India. Collection of seeds. Plants raised for distribution.
SKELTON, R. T., Hullaar. Cacti. Planted on rockery.
SMITH, Messrs., Aberdeen. Potato 'Witchill Seedling.' See p. 565.
SMITH, A. L., Catford. Cape Pelargoniums. Growing on.
SMITH, F. W., Weybridge. Marrow 'Earliest of All.' See p. 572.
SPENCE, Mrs., Guildford. Violets. Planted on rockery.
SPENCER, F. M., Crawley Down. Cuttings of *Helianthemum Serpyllum plenum.* Growing on.
SPENCER, T. Ross. Cucumber 'Ne plus Ultra.' See p. 576.
SPENCER-EVANS, J., Newbury. Collection of seeds. To be sown.
STARK, Messrs., Great Ryburgh. Sweet peas. See p. 271.
STAWARD, R., Hertford. Potatos. See p. 565.
STEPHENS, M., Ewhurst. *Berberis Bealei* (planted in garden); *Astilbe venusta superba* (planted in bog garden).
STOKES, Messrs., Trowbridge. Potato 'Hillside Gem' (see p. 565); Marrow 'Hillside Selected' (see p. 572).
STOTHERD, Messrs., Camberley. Violets. Planted in garden.
STREET, F., Victoria, B.C. Bulbs of *Erythronium.* Planted in garden.
STRUGNELL, W., Trowbridge. Melons. See p. 561.
STUART, Mrs. A., Edinburgh. Seeds and bulbs from Egypt. Growing on.
SUTTON, Messrs., Reading. Marrows (see p. 572); melons (see p. 561).
SYDENHAM, Messrs., Birmingham. Potatos (see p. 565); carrots (see p. 575); cucumbers (see p. 576); peas (see p. 578); savoys (see p. 580).
TAYLOR, Messrs., Tunbridge Wells. Sweet Pea 'Mrs. Charles Taylor.' See p. 273.
TAYLOR, G., Ferrybridge. Plants of *Daphne Mezereum.* Planted in garden.
TAYLOR, W., Bath. Taylor's Grape Preservers. See p. 582.
TERRY, Mrs., Guildford. Plants for the rockery.
THE BOUNDARY CHEMICAL CO., Liverpool. 'Demon' Insecticide. See p. 582.
THE CONARD JONES CO., Philadelphia, U.S.A. Collection of Cannas. Growing on.
THE FOLDING SPAN LIGHT CO., Slough. Folding frame. See p. 582.

THE HARDY PATENT PICK CO., Sheffield. Spade, fork, and trowel. For trial.
THOMPSON & CHARMAN, Messrs., Bushey. *Paeonia arborea lutea.* Planted in garden.
THOMSON, P. M., Mealsgate. Potato 'Ashleaf Kidney.' See p. 565.
THURSTON, Mrs., Romsey. Seeds from West Indies. To be sown.
TIDY, A., Cobham. Melon seed. See p. 561.
TOD, H. M., London. Vines. Planted in garden.
TOOGOOD, Messrs., Southampton. Potatos (see p. 565); Vegetable Marrow 'Toogood's Delicacy' (see p. 572).
TORKINGTON, Col., Farnham. Cuttings of dark purple *Bougainvillaea.* Growing on.
TRAHERNE, Capt., Strathaven. *Primula obconica grandiflora* (growing on); Carnations and Chrysanthemums, for distribution.
TREVOR, W., St. Leonards-on-Sea. 'Swanyck' labels. See p. 583.
TROLLOPE, Mrs., Cobham. *Phlox canadensis.* Planted on rockery.
TUCKER, T. B., Weybridge. Bedding Pelargonium 'Arborfield Gem.' See p. 549.
TURNER, A., Chelmsford. *Veronica* sp., *Crucianella stylosa.* Planted on rockery.
TURNER, A., Slough. Violas. Growing on.
UNGER, A., Heidelberg. Seeds of *Pyrus ussuriensis.* Plants raised.
UNWIN, Miss, Farnham. Bulb from S. Nigeria. Growing on.
UPSALA, BOTANIC GARDEN. Collection of seeds. Plants raised for distribution.
U.S.A. DEPARTMENT OF AGRICULTURE, Washington. Collection of Rubus sp. Growing on.
VEITCH, Messrs. J., Chelsea. Potatos (see p. 565); melons (see p. 561); marrows (see p. 572); shallots (see p. 580); miscellaneous flowers (see p. 565); *Primula pycnoloba* (growing on).
VEITCH, Messrs. R., Exeter. Potatos (see p. 565); peas (see p. 578); miscellaneous collection of vegetable seeds (see p. 575); collection of flower seeds (see p. 555); seeds of Calceolarias (to be sown).
VICKERAGE, G., Chelsea. Patent flower pot. See p. 582.
VIENNA, BOTANIC GARDEN. Collection of seeds. Plants raised for distribution.
VIZARD, W. D., Cheltenham. Strawberries. Growing on.
VON ERNSTHAUSEN, Baron, Ditton Hill. Seeds obtained by crossing *Anthurium Andreanum* with dwarf Arum 'Little Gem.' Failed to germinate.
VOSS, Messrs., London. Creol, Lime-sulphur, Naphtho-nicotyl. For trial.
WAITE, F., Boston. Potatos. See p. 565.
WAKELEY, Messrs., London. Hop manure. For trial.
WALLACE, Messrs., Colchester. Violas. For trial.
WALTERS, Messrs., Rugby. Plant supports. See p. 582.
WARD, H. A., Birmingham. Patent label. See p. 582.
WARE, Messrs., Feltham. Plants for rockery.
WATT-BLACK, Mrs., Edenbridge. Cuttings of Viola. Growing on.
WATTS, W. A., St. Asaph. Carnation 'W. A. Watts.' Growing on.
WAUGH, G. W., Letchworth. Seed of Calceolaria.
WELLS, Miss, Petersfield. Seeds. Distributed to the Fellows.
WELLSON, Messrs., Leeds. Manures. For trial.
WEST, E. C., London. Raffiatape, flower holders, and plant labels. For trial.
WEST, Mrs., Newport. Echium, Australian Sollya. Growing on.
WHITE, Messrs., Paddock Wood. 'Abol' syringe; 'Abol' knapsack sprayer; 'Abol' insecticide. For trial.
WHITELEGG & PAGE, Messrs., Chislehurst. Saxifrage 'Red Admiral.' Planted on rockery.
WILKS, Rev., M.A., Shirley. Eyes of *Vitis Thunbergii* (growing on); seeds of *Elaeagnus Fredericii aurea*; plants of Salvia and Anchusa (planted on rockery); *Euonymus latifolius, Salvia Sclarea, Campanula longistyla, Verbascum* 'Miss Willmott' (planted on rockery); seeds of *Lobelia Dortmanna;* plants of *Paeonia alba superba* (planted in garden); seeds of *Alnus cordifolia* 'Godington Park' var.
WILLIAMS, C., Gorran. Shrubs and conifers. Planted in the garden.
WILLIAMS, Mrs. W., Horticultural Magazine for Library.
WILLIAMS, P. D., St. Keverne. *Rhododendron lutescens.* Planted on rockery.
WILLMOTT, Miss, F.L.S., V.M.H., Great Warley. Collection of seeds (plants raised for distribution); collection of shrubs (planted on rockery); varieties of *Primula viscosa* (planted on rockery).

WITH'S CHEMICAL MANURE Co., Hereford. Samples of Tomato Plant Food, Carbon Universal Manure. See p. 583.
WOOD, B., Liverpool. Violas. Growing on for trial.
WOOD, G., Hawick. Violas. Growing on for trial.
WOODS, Mrs., Bexley Heath. Cuttings of *Iberis gibraltarica.* Growing on.
WOODS, F., Hatfield Park. Violas. Growing on for trial.
WRIGHT, Miss, Weybridge. Seeds from S. Africa. Failed to germinate.
YATES, W. H. Viola 'Rotherfield Belle.' See p. 285.
YOUNG, Messrs., Cheltenham. Collection of Carnations. Growing on.

NOTES ON RECENT RESEARCH

AND

SHORT ABSTRACTS FROM CURRENT PERIODICAL LITERATURE, BRITISH AND FOREIGN,

AFFECTING

HORTICULTURE & HORTICULTURAL SCIENCE.

JUDGING by the number of appreciative letters received, the endeavour commenced in volume xxvi. to enlarge the usefulness of the Society's Journal, by giving an abstract of current Horticultural periodical literature, has met with success. It has certainly entailed vastly more labour than was anticipated, and should therefore make the Fellows' thanks to those who have helped in the work all the more hearty.

There are still, we feel, some departments of Horticulture and Horticultural Science very imperfectly represented in these abstracts, and the Editor would be grateful if any who have time at command, and who are willing to help in any special direction in this work, would communicate with him. He desires to express his most grateful thanks to all who co-operate in the work, and he ventures to express the hope that they will all strictly adhere to the general order and scheme of working, as the observance of an identical *order* can alone enable the Editor to continue to cope with the work. The order agreed on is as follows :—

1. To place first the name of the plant, disease, pest, &c., being noticed; and in this, the prominent governing or index word should always have precedence.

2. To place next the name, when given, of the author of the original article.

3. Then, the abbreviated form of the name of the journal, &c., in which the original article appears, taking care to use the abbreviation which will be found on pp. 625, 626.

4. After this, a reference to the number, date, and page of the journal in question.

5. If an illustration be given, to note the fact next, as "fig.," "tab.," or "plate."

6. After these preliminary necessities for making reference to the original possible for the reader, the abstract or digest should follow, ending up with the initials of the contributor affixed at the close of each Abstract or Note.

Names of those who have kindly consented to help in this Work.

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Scott Elliot, G. F., M.A., B.Sc., F.L.S., F.R.H.S., F.R.G.S.
Smith, William G., B.Sc., Ph.D., F.R.H.S.
Swire, W., F.R.H.S.
Veitch, Harry J., F.L.S., F.Z.S., F.R.H.S.
Voss, W. A., F.C.S., F.R.H.S.
Webster, A. D., F.R.H.S.
Welby, F. A., F.R.H.S.
Whittles, W., F.R.H.S.
Williams, S. E., F.R.H.S.
Wilson, Gurney, F.L.S., F.R.H.S.

JOURNALS, BULLETINS, AND REPORTS

from which Abstracts are made, with the abbreviations used for their titles.

Journals, &c.	Abbreviated title.
Agricultural Gazette of New South Wales	Agr. Gaz. N.S.W.
Agricult. Journal, Cape of Good Hope	Agr. Jour. Cape G.H.
Annales Agronomiques	Ann. Ag.
Annales de la Soc. d'Hort. et d'Hist. Naturelle de l'Hérault	Ann. Soc. Hé.
Annales de la Soc. Nantaise des Amis de l'Hort.	Ann. Soc. Nant. des Amis Hort.
Annales des Sciences Naturelles	Ann. Sc. Nat.
Annales du Jard. Bot. de Buitenzorg	Ann. Jard. Bot. Buit.
Annals of Botany	Ann. Bot.
Beiheft zum Botanischen Centralblatt	Beih. Bot. Cent.
Boletim da Real Sociedade Nacional de Horticultura	Bol. R. Soc. Nac. Hort.
Boletim da Sociedade Broteriana	Bol. Soc. Brot.
Botanical Gazette	Bot. Gaz.
Botanical Magazine	Bot. Mag.
Bulletin de la Société Botanique de France	Bull. Soc. Bot. Fr.
Bulletin de la Soc. Hort. de Loiret	Bull. Soc. Hort. Loiret.
Bulletin de la Soc. Mycologique de France	Bull. Soc. Myc. Fr.
Bulletin Department of Agricult. Brisbane	Bull. Dep. Agr. Bris.
Bulletin Department of Agricult. Melbourne	Bull. Dep. Agr. Melb.
Bulletin of the Botanical Department, Jamaica	Bull. Bot. Dep. Jam.
Bulletin of Bot. Dep. Trinidad	Bull. Bot. Dep. Trin.
Bullettino della R. Società Toscana d' Orticultura	Bull. R. Soc. Tosc. Ort.
Canadian Reports, Guelph and Ontario Stations	Can. Rep. G. & O. Stat.
Centralblatt für Bacteriologie	Cent. f. Bact.
Chronique Orchidéenne	Chron. Orch.
Comptes Rendus	Comp. Rend.
Contributions from U.S.A. Herbarium	Contr. fr. U.S.A. Herb.
Department of Agriculture, Victoria	Dep. Agr. Vict.
Department of Agriculture Reports, New Zealand	Dep. Agr. N.Z.
Dictionnaire Iconographique des Orchidées	Dict. Icon. Orch.
Die Gartenwelt	Die Gart.
Engler's Botanische Jahrbücher	Eng. Bot. Jah.
Gardeners' Chronicle	Gard. Chron.
Gardeners' Magazine	Gard. Mag.
Gartenflora	Gartenflora.
Journal de la Société Nationale d'Horticulture de France	Jour. Soc. Nat. Hort. Fr.
Journal Dep. Agricult. Victoria	Jour. Dep. Agr. Vict.
Journal Imperial Department Agriculture, West Indies	Jour. Imp. Dep. Agr. W.I.
Journal of Agricultural Science	Jour. Agr. Sci.
Journal of Botany	Jour. Bot.
Journal of Chemical Society	Jour. Chem. Soc.
Journal of Economic Biology	Jour. Econ. Biol.
Journal of Economic Entomology	Jour. Econ. Entom.
Journal of Genetics	Jour. Gen.
Journal of Horticulture	Jour. Hort.
Journal of the Board of Agriculture	Jour. Bd. Agr.
Journal of the Linnean Society	Jour. Linn. Soc.
Journal of the Royal Agricultural Society	Jour. R.A.S.
Journal S.E. Agricultural College, Wye	Jour. S.E. Agr. Coll.
Kaiserliche Gesundheitsamte	Kais. Ges.
La Pomologie Française	Pom. Franç.
Le Jardin	Le Jard.
Lebensgeschichte der Blutenpflanzen Mitteleuropas	Lebens. d. Blutenpfl.
Mycologia	Mycologia
Naturwiss. Zeitschrift Land und Forst	Nat. Zeit. Land-Forst.
Notizblatt des Königl. Bot. Gart. und Museums zu Berlin	Not. König. Bot. Berlin.
Oesterreichische Garten-Zeitung	Oester. Gart. Zeit.

Journals, &c.	Abbreviated title
Orchid Review	Orch. Rev.
Orchis	Orchis.
Phytopathology	Phytopathology.
Proceedings of the American Pomological Society	Am. Pom. Soc.
Quarterly Journal of Forestry	Quart. Jour. of Forestry.
Queensland Agricultural Journal	Qu. Agr. Journ.
Reports of the Missouri Botanical Garden	Rep. Miss. Bot. Gard.
Revue de l'Horticulture Belge	Rev. Hort. Belge.
Revue générale de Botanique	Rev. gén. Bot.
Revue Horticole	Rev. Hort.
The Garden	Garden.
Transactions Bot. Soc. Edinburgh	Trans. Bot. Soc. Edin.
Transactions of the British Mycological Soc.	Trans. Brit. Myc. Soc.
Transactions of the Massachusetts Hort. Soc.	Trans. Mass. Hort. Soc.
Transactions Royal Scot. Arboricultural Soc.	Trans. Roy. Scott. Arbor. Soc.
U.S.A. Department of Agriculture, Bulletins	U.S.A. Dep. Agr.*
U.S.A. Experimental Station Reports	U.S.A. Exp. Stn.†
U.S.A. Horticultural Societies' publications	U.S.A. Hort. Soc.†
U.S.A. State Boards of Agriculture and Horticulture	U.S.A. St. Bd.†
Woburn Experiment Farm Report	Woburn.

* The divisions in which the U.S.A. Government publish Bulletins will be added when necessary.

† The name of the Station or State will in each case be added in full or in its abbreviated form.

NOTES AND ABSTRACTS.

Agave, Dasylirion, Bonapartea, and Beschorneria. By R. de Noter (*Rev. Hort. Belge*, p. 301, Sept. 15, 1911; p. 309, Oct. 1, 1911; p. 326, Oct. 15, 1911; p. 348, Nov. 1, 1911; p. 358, Nov. 15, 1911; p. 394, Dec. 15, 1911).—A descriptive list of all the species of the above genera, with notes on their suitability to certain positions. The series of articles is continued in later numbers of the *Revue*.

M. L. H.

Agricultural Possibilities of the Canal Zone. By H. H. Bennett and W. A. Taylor (*U.S.A. Dep. Agr., Bur. Soils and Pl. Ind., Rep.* 95; March 1912; map and 12 plates).—The canal zone comprises a strip of land ten miles wide and forty-five miles long, extending from Colon to Panama, with the canal running through the middle. It is at present almost unused except for the most primitive patch agriculture. It is expected that with the opening of the canal there will be a large demand for garden and dairy produce to supply passing steamers and the white population engaged in its maintenance. It is considered that the most promising line upon which to commence will be to develop a permanent mixed tropical agriculture with a distinct horticultural trend, while a most important part of the work will be the introduction, selection, and raising of varieties of plants suited to the climatic and soil conditions of the country.—*A. P.*

Anabasis, A Cushion-Plant. By Hans Hauri (*Beih. Bot. Cent.* Bd. 28, pp. 323-421; 2 plates and 22 figs.).—This is a detailed anatomical and physiological study of *Anabasis aretioides* Roq. et Coss., a "polster" or cushion-plant of the Algerian Sahara, and a discussion regarding cushion-plants in general.

The microscopical structure of the leaves, stem, and root is of a most unusual character, and is very fully described by the author. He also describes fully the way in which the compact hemispherical surface (which is further filled up by sand into a solid mass) enables it to resist the constant wind with sand particles (a sand blast) in a hot and arid climate.

He considers that it obtains water by the root, and is in every particular adapted to retain water strongly.

The plant contains much hemicellulose and allantoin (albuminoids), and the ash (amounting to 18·58 per cent. of dry weight) contains nearly 50 per cent. CaO.

The paper should be of great interest to ecologists.—*G. F. S. E.*

Ants, To Destroy. By Dr. Baudin (*Rev. Hort. Belge*, p. 324; Oct. 1, 1911).—A certain means of banishing ants is said to be the

use of hyposulphate of soda. A kilo. of the hyposulphate must be dissolved in 10 litres of water, which should then be sprinkled, cold or hot, in any corner indoors frequented by ants. The creatures will disappear at once. Even a plateful of the solution placed on the shelves of infested cupboards will banish them. Out of doors their heaps should be watered with large quantities of the liquid, boiling if possible, at nightfall. This will destroy every ant.—*M. L. H.*

Apple and Pear Market in Europe. By Hon. H. B. Miller (*U.S.A. St. Bd. Hort., Oregon, Rep.* 1909-10, p. 111).—The U.S.A. provide Great Britain with about one-third of the apples she imports, Canada coming next. These apples do not compete with those from Australia and Tasmania, which come into the market at a different time of year.

The cost of transporting a box of apples to the European market from the Pacific coast is 75 cents, which will probably be reduced to 35 cents when the Panama Canal is opened.

France supplies us with half our pears, Belgium coming next, and America third. But there is room for a great increase in the latter trade, especially if Oregon will send more autumn and winter pears, the French and Belgian varieties not keeping well so late in the season.

The latter part of 1910 saw South Africa sending large consignments of 'William' pears. These are the same as the American 'Bartlett' pears, and are plentiful in the spring.

The establishment of general packing-houses (under an association of Oregon fruit-growers), with guaranteed uniform packing, has had a marked effect in improving grading, and corresponding better returns in cash.—*C. H. L.*

Apple "Baldwin Spot" or "Stippin." By H. H. Whetzel (*U.S.A. St. Fruit Growers' Ass., New York*; 1912).—A description of this disease, which is better known in England as "bitter pit," is given, and the conclusion arrived at that it is the result of interference with the water supply. Treatment lies in equalizing the water supply so that at no time does the tree suffer from an excessive supply or from drought. Drainage, cultivation, and spraying so as to avoid the loss of foliage all tend to this.—*F. J. C.*

Apple Fruit Spot and Quince Blotch. By C. Brooks and C. A. Black (*Phytopathology*, ii. pp. 63-72; April 1912; 2 plates). Small dark-green, slightly sunken spots with minute black specks upon them characterize this disease on the quince. They appear in August or early September, being most numerous at the flower end of the fruit. They do not develop to any extent in storage. Those on the apple are very similar but frequently change to brown or black later and the tissues may become soft. A fungus was isolated and cross inoculations made showing the forms on the two fruits to be identical. The name *Cylindrosporium pomi* was originally given to this fungus, but now a phoma stage has been discovered, and the

name must be changed to *Phoma pomi*. Spraying with Bordeaux mixtures twice before the middle of July is suggested as a probably efficient method of control.—*F. J. C.*

Apple Leaf Spot and Canker, Inoculation Experiments with Associated Fungi. By C. E. Lewis (*Phytopathology*, ii. pp. 49-62; April 1912).—The results of the experiments show that *Sphaeropsis malorum* is the only fungus of several isolated from dead spots on apples that is capable of producing fresh spots on apple foliage. *Phyllosticta limitata*, *Coniothyrium pirinum*, and *Coryneum foliicolum* were also tried. *Sphaeropsis* also attacks branches and twigs readily, while *Coryneum* and *Phoma* do less damage. *Myxosporium* and *Cytospora* failed to attack healthy branches, but may attack weakened ones.—*F. J. C.*

Apple Leaf Spot. By C. Brooks and M. De Merritt (*Phytopathology*, ii. pp. 181-190; figs.).—The authors consider that the fungus *Sphaeropsis malorum* is largely the cause of the leaf spot of apples in New Hampshire, though they appear to think that other fungi may at times be the cause. They isolated and cultivated several strains of the fungus varying in their vigour and infective capacity, the large spored form being the most virulent. Infection comes principally from canker spots on the shoots, and the young leaves are the first attacked, but infection may take place at any time up to the end of August. The most effective preventive means was found in the lime-sulphur wash, self-boiled. Lime 9 lb., sulphur 6 lb., and water 50 gallons.—*F. J. C.*

Apple Moth, The Light Brown. By C. French, junr. (*Jour. Dep. Agr., Victoria*, x. p. 111, Feb. 1912).—The occurrence of this insect (*Tortrix* (*Cacoecia*) *responsana*) as a vine-pest is noted. The greenish larvæ burrow into the fruit which they destroy. Apples and many garden plants are attacked. Arseniate of lead spray and trapping moths by means of light are both effective.—*F. J. C.*

Apple Pest, Remarks upon an Apparently New. By W. E. Collinge (*Jour. Econ. Biol.* vii. pp. 64, 65; June 1912).—The plant bug *Lygus pratensis* was found to oviposit in the young fruits of apple, causing the ultimate formation of dimples and discoloration somewhat like that due to scab. Two or three only occur on each of the attacked fruits.—*F. J. C.*

Apple Red-Bugs, The. By C. R. Crosby (*U.S.A. Exp. Stn., Cornell, Bull.* 291; Jan. 1911; 22 figs.).—This bulletin treats of two new apple pests (*Heterocordylus malinus* Reut. and *Lygidea mendax* Reut.) They are sucking insects of a bright red colour, and the fruit, when injured by them, is unmarketable. Both species pass through five immature stages and attain wings at the fifth moult.

Contact spraying with black-leaf tobacco extract has been found the most satisfactory method of control.—*V. G. J.*

Apple Scab, On the Use of the Lime-Sulphur Wash against. By E. S. Salmon, F.L.S. (*Jour. S.E. Agr. Coll.*, 1911; p. 12).—The general absence of "scab" in the season of 1911 nullified experiments on its control. Most apples were found to withstand spraying with lime-sulphur of a specific gravity of 1.01 and Cox's Orange Pippin at the strength of sp. gr. 1.005 even when two applications were made.
F. J. C.

Bark-Weevils of the Genus Pissodes, Contributions towards a Monograph of the. By A. D. Hopkins, Ph.D. (*U.S.A. Dep. Agr., Bur. Entom., Tech* ser. xx. pt. 1; Jan. 1911; 22 plates, 9 figs.).—The genus *Pissodes* is of special interest in connexion with forest entomology, and represents an important class of enemies of pine, spruce, and fir trees. For this reason there is likely to be a demand for information on the subject, and for practical methods of preventing or reducing the damage caused by their attacks. Hitherto little has been known of the North American species, and the author of this monograph revises the generic and specific descriptions, describes the species recognized by him as being new to science, and records some of the results of the more technical features of the investigations.—*V. G. J.*

Beet Web-worm, The Hawaiian. By H. O. Marsh (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 109, pt. i.; Nov. 1911; 1 plate, 2 figs.).—In the Hawaiian Islands the larvæ of the beet web-worm (*Hymenia fascialis* Cram.) include among their food plants, table and sugar-beets, mangel-wurzels, several species of *Amaranthus*, *Euxolus*, purslane, cucumbers, and Chenopodiaceous weeds. Unless it can be controlled it is unlikely that sugar-beet can be profitably grown, as, next to *Amaranthus*, the beet is its favourite food.

The author describes experiments carried on with various insecticides, the best of which is apparently a solution of 2 lb. Paris green, 8 lb. whale-oil soap in 100 gallons of water. If properly applied to the under surface of the leaves it is absolutely effective in destroying the larvæ and does no harm to the foliage.—*V. G. J.*

Beet Web-worm, The Southern. By F. H. Chittenden, Sc.D. (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 109, pt. ii.; Nov. 1911; 1 fig.). The Southern Beet web-worm (*Pachyzancla bipunctalis* Fab.) is allied to the Hawaiian Beet web-worm, and is undoubtedly of tropical origin though inclined to be cosmopolitan in any climate that suits it. It is recorded from Pernambuco, Bonito, Brazil, Florida, the West Indies, and South Africa.

A spray of Paris green, as recommended in part i. of this bulletin for the Hawaiian Beet web-form, is the best means of exterminating it.
V. G. J.

Bleeding of Plants. By Wlad. Schaposchnikow (*Beih. Bot. Cent.* Bd. 28, Abt. i. Heft 3, pp. 487-506; 4 figs.).—The author experi-

mented with birch, Geranium hybrid, Fuchsia, and Dahlia. Two plants were selected (as nearly alike as possible), of which one (*a*) was not watered for two to four days, whilst the other (*b*) was supplied plentifully with water.

The plants were then cut across (under water), and the amount and rate of bleeding in each case was observed and plotted.

It was found that the bleeding from (*a*) was in every case much more severe than that from (*b*). In many cases more than double the amount of fluid was given off by the (*a*) plants. At the moment of cutting there is diminished pressure (*schroffen saugung*, abrupt sucking), which soon vanishes. The fluid given off in bleeding then increases more or less rapidly to a maximum amount, and afterwards gradually diminishes.

The author discusses these results with reference to the supposed osmotically active substances formed in the stem and the effect of diminished pressure in the vessels.—*G. F. S. E.*

Bordeaux Mixture, Test for—Fungicide Sprays. By F. de Castella (*Jour. Dep. Agr., Victoria*, p. 116, Feb. 1912).—A strip of white blotting-paper dipped in a 2 per cent. solution of phenolphthalein and allowed to dry makes a very good indicator for neutrality.

C. H. H.

Bullfinch, The Food of the. By W. E. Collinge (*Jour. Econ. Biol.* vii. pp. 50-57; June 1912).—The examination of the contents of the crops of 308 bullfinches at intervals spread over the whole year confirms the general idea of the damage done by this handsome bird. Only one bird's crop contained an insect. For about half the year fruit-trees are damaged wholesale by it, and weed seeds are eaten during the remainder of the year. The damage done to fruit-trees, however, far outweighs any checking of weeds by them.—*F. J. C.*

Canary Islands, Note on. By Dr. G. V. Perez (*Rev. Hort. d'Alg.* p. 95; March 1912).—The Canary Islands have been seriously affected for the second time by the competition of chemical products. Soda and potash are now procured otherwise than from the ashes of several sorts of *Mesembryanthemum*, of which these islands used to furnish an important quantity, and now mineral colourings have taken the place of cochineal, which they produced extensively on plantations of *Opuntia cochinilliera*. This article suggests other crops which may be grown in the Canaries, and gives a list of the rare or remarkable plants which are to be found in the islands.—*M. L. H.*

Canephora, Anatomy of. By H. F. Wernham (*Beih. Bot. Cent.* Bd. 28, pp. 453-472; 7 figs.).—The author describes and figures the peculiar anatomical characters of three species of this Madagascar genus. The peduncle of the inflorescence is invariably borne in the axil of a leaf, but though the main bundle is a completely closed cylinder, there is a faint suggestion of dorsiventrality both internally and externally. Tannin is generally plentiful.—*G. F. S. E.*

Canna Leaf-Roller, The Larger. By F. H. Chittenden, Sc.D. (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 145; March 1912; 8 figs.).—This leaf-roller is the larva of a butterfly (*Calpodes ethlius*, Cram.) of tropical origin, and has done considerable damage to decorative Cannas growing in public parks and private gardens in the vicinity of Washington and many parts of the States. Cannas with brown leaves are more prone to attack than the green-leaved varieties, probably on account of the toughness of the latter. Hand-picking and spraying with arsenicals is recommended by the author, who emphasizes the fact that whatever method of control is used, it should be done early in the season.—*V. G. J.*

Ceratonia siliqua, To Hasten Germination of the Seeds of (*Rev. Hort. d'Alg.* p. 433; Dec. 1911).—To produce rapid germination of the seeds of the *Ceratonia siliqua* throw them into water just as it reaches boiling-point, then draw the vessel away from the fire and let the seeds soak for twenty-four hours. Afterwards sow in drills in well-worked soil. Water frequently until the first leaves appear, when the watering should be reduced.—*M. L. H.*

Chestnut Blight Fungus. By C. L. Shear (*Phytopathology*, ii. pp. 211-212; Oct. 1912).—The author has examined numerous specimens of the fungus *Endothia radicalis*, which he has collected on the dead stumps of the sweet chestnut, and concludes that the fungus known hitherto as *Diaporthe parasitica*, and parasitic in America, is identical with it.—*F. J. C.*

Chestnut Blight Fungus and a related Saprophyte. By P. J. Anderson and H. W. Anderson (*Phytopathology*, ii. pp. 204-210; Oct. 1912).—The authors discuss the nomenclature of the fungus hitherto known as *Diaporthe parasitica*, and come to the conclusion that more than one fungus has been confused under this name. They assign the true fungus to the genus *Endothia*, and suggest the name *E. parasitica* for it. The related fungi are *E. radicalis* and *E. virginiana*, a new species.—*F. J. C.*

Chlorosis, Treatment for (*Rev. Hort. d'Alg.* p. 123; April 1912).—A solution of 2 per cent. iron sulphate watered on in dull grey weather, or preferably after sunset, is recommended against chlorosis. If the chlorosis be produced by accidental causes, the sulphate-of-iron treatment will be found of great advantage, but in those fairly frequent cases where the disease proceeds from the bad quality of the soil or too much damp at the roots the cause must also be removed or counteracted.—*M. L. H.*

Cistus, Hybrids of. By Ed. Barnet (*Beih. Bot. Cent.* Bd. 29, pp. 306-394; 15 figs.).—This is an important contribution to the theory of heredity, and should certainly be studied by all interested in practical hybridization.

Seventeen species of *Cistus* and one *Helianthemum* were used in

these researches, and a large number of species were crossed both ways. A certain number of second-generation hybrids were obtained.

Not only the original species, but the hybrids are described in considerable detail. The anatomical structure was specially examined and is often figured.

The author finds that the hybrids are more usually homogeneous, but in eight cases are heterogeneous; well-marked differences occur in three sets of reciprocal crosses. There are all sorts of transitions, both between brother hybrids and reciprocal crosses, some resembling each other closely and others showing great differences. The differences often resemble those that characterize Jordan's species.

In crosses between those species which have five and those which have three sepals the majority have five sepals, a very few have three sepals, but others have four sepals, and occasionally forms with six and seven sepals occur. In crosses of *C. ladaniferus* (ten loculi) with others (five loculi) he found in one set of sixty-five capsules, fifty with five, fourteen with six, and one with seven loculi. The species used differ considerably in the character of the hairs, which vary from stellate to simple. These were inherited differently. Intermediate forms of hair occurred in thirteen out of eighteen cases, sometimes with, sometimes without the characteristic form of one of the parents; or in a very few cases only one type of hair was transmitted, or sometimes both kinds occurred together in the hybrid.

In a few cases a single branch of a hybrid resembled the father, whilst another branch of the same plant took after the mother.

Occasionally one character appears identical with that of one of the parents, but examples of heredity from both parents are more frequent and more distinct.

The sterility of the pollen was in most hybrids a very marked characteristic. In one case only the pollen seemed to be of a normal character. In many cases all the pollen-grains were empty, and in most hybrids at least 70 per cent. were so.

The spots on the petals of *C. ladaniferus* var. *maculatus* were sometimes strongly marked in the descendant, but in one case were not transmitted at all, and in other cases differed greatly in size in different individuals.

The characters transmitted by a species vary with the mate selected, according to the affinity of the two species. The predominance of the mother was clear in seven and of the father in two cases. In vine hybrids the predominance of the pollen parent is the general rule.

These instances are sufficient to show the importance of this paper.—*G. F. S. E.*

Coconut Bud-rot, The History and Cause of the. By John R. Johnstone (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 228; 1912).—The author of this paper claims to have shown that the organism giving rise to Bud-rot of Coconut is identical with *Bacillus coli* of animal origin.

Inoculations of young palms with *B. coli* isolated from animals gave exactly the same symptoms as the typical bud-rot.

The bud-rot of coconut palm seems to be a very serious one in the American Tropics. The disease progresses very rapidly and as it starts in the minor tissues of the main bud, no sprays, &c., are of any avail.

The disease is also reported from other parts of the world—in Ceylon, British India, Philippines, German East Africa, &c., and especially in Cuba.

It is believed that birds and insects are carriers of the disease. It causes an evil-smelling rot in the bud.

It is recommended to cut down and burn all diseased trees, débris, fallen nuts, &c.

Good figures are given.—*D. M. C.*

Codling Moth and its Control on Pears in California, Life-History of the. By S. W. Foster (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 97, pt. ii.; April 1911; 1 plate, 9 figs., 51 tables).—Two, and preferably three, sprayings are advised, using arseniate of lead (4 lb. to 100 gallons of water). The first application to be made as soon as the petals fall, the second treatment three to five weeks later, and the third about two weeks before the picking commences.—*V. G. J.*

Coffea Species, A Morphological and Physiological Investigation of the Flowers of. By Dr. F. C. von Faber (*Ann. Jard. Bot. Buit.* ser. ii. vol. x. pt. i. pp. 59-160; 1912; 12 plates).—This memoir contains a minute and careful description of the chief morphological and cytological facts connected with the flower of the coffee plant.

The ovule possesses only a single integument, which is a massive structure, whilst the nucellus is very small and almost limited to the embryo-sac. Usually only a single ovule develops in each loculus of the ovary, but in cases of polyembryony two or three such ovules develop in each loculus. In the development of the embryo-sac the mother-cell divides into four daughter-cells, of which the uppermost becomes the embryo-sac. The somatic chromosomes number sixteen, whilst the reduced number is eight in this plant. The cytological details of the reduction division in the development of the embryo-sac and also in the pollen-development are carefully described. Fertilization is next dealt with. Double fertilization was observed. The formation of the endosperm and the development of the embryo and seed-coats are then touched upon at some length. The cases of polyembryony are then noted. The author concludes that where more than one embryo spring from one seed of coffee these most probably arise from the simultaneous development of two separate ovules in one loculus of the ovary, and that they do not form cases of true polyembryony. Experiments and observations upon the pollination of the coffee blooms are next described. Self-pollination takes

place in the bud. If, however, cross-pollination is effected immediately on the opening of the bud, the foreign pollen grows more rapidly than the grains from the same flower, and cross-fertilization is brought about. If no such cross-pollination takes place, the pollen from the same flower (which reached the stigma during the bud stage) continues its growth and effects self-fertilization. A number of experiments are quoted to show the quicker growth of the foreign pollen than the self-pollen. This is an interesting adaption by which self-fertilization is assured if cross-pollination fails to take place.

A number of experiments were carried out upon the life and germination of the pollen-grains of coffee. They germinate in water. They germinate particularly well in cane-sugar solutions of 20 per cent. The pollen-grains were also grown on solid media, such as agar-agar. The effect of various carbohydrates (grape sugar, milk sugar, arabinose) upon the growth of the pollen-tube was tested. Malic acid was found to have no accelerating effect upon the growth of these pollen-tubes. The length of life of the pollen-grain under different external conditions was studied. The moisture of the atmosphere was found to exert a very considerable influence on the length of life of the pollen-grains. Thus the pollen-grains of *Coffea liberica* only remained capable of germination for two days in an atmosphere with a vapour tension of 90 per cent., whilst with a vapour tension of 30 per cent. they retained their vitality for seven days, and in air dried over concentrated sulphuric acid they remained unharmed for eight days. The partial sterility of some varieties of coffee is a well-known phenomenon to planters, and the present author describes its appearance and the cytological processes which determine it.

The sterile blooms known by the Dutch name of "sterretjes" are described in the next section of the work. They are most common in *C. arabica*, less common in *C. liberica*, and very rare in *C. Laurentii*, *C. uganda*, and *C. quillon*.

In these flowers the calyx is either entirely absent or reduced to a minute rudiment; the corolla is also very much reduced; and the petals are fleshy in substance instead of thin as in the normal flowers. The stamens are also modified in these "sterretjes" blooms.

The cytology of the sexual apparatus of these blooms is described.

The author concludes that these flowers are ordinary blooms which from some cause or other have become arrested at an early stage of their development. Experiments were made by the author to determine, if possible, the causes producing the sterility of the blooms. The effects of light and of soil-moisture, separately or combined, were especially studied.—*R. B.*

Colour-Changes in Flowers. By H. Fitting (*Zeitschr. f. Bot.*, Bd. iv. pp. 81-105; 1912).—The normally blue flowers of *Erodium gruinum* and *E. ciconium* become rose-red when heated, and at a high temperature almost colourless. On cooling, the changes are reversed,

and the flowers become blue again on reaching the normal temperature (about 20° C.). The same colour-changes occur in the case of flowers killed by chloroform or steam, and in watery extracts of the anthocyan pigment of the flower; hence they are quite independent of the living cells containing the pigment. Similar changes were also observed in flowers of *Geranium*, *Iris bohemica*, *Viola hortensis*, *Salvia*, *Azalea*, &c., but in these cases a greater rise in temperature (usually of about 30°) is necessary before the change begins—in the *Erodium* species a rise of only 3° or 4° is sufficient to cause a distinct change of tint. The author suggests that dissociation phenomena play a part in this remarkable phenomenon of pigment alteration by heat.—*F. C.*

Conifers, Disease of. By J. R. Weir (*Phytopathology*, ii. p. 215; Oct. 1912).—Reports a disease of conifers which causes the killing back of the young shoots. It is due to a fungus probably identical with *Botrytis Douglasii* and attacks many other conifers besides the Douglas fir. It is common in the North-western States in the forests.

F. J. C.

"Copyright" in Horticultural Varieties. By Casimir Peyron (*Rev. Hort. d'Alg.* p. 90; March 1912).—The question of securing due recognition and remuneration to the raisers of valuable novelties has been mooted at various horticultural meetings, but is not an easy one to solve. This article suggests the need of legislation on the subject and states the difficulties in the way.—*M. L. H.*

Cotton Plant, Some Principles of Hybridization as Applied to. By Dr. Trabut (*Rev. Hort. d'Alg.* p. 130; May 1912).—Any plant which has been under cultivation from early times is liable to be so much modified and altered in different ways that it is almost impossible to arrive at what was its primitive wild type. If the cultivated race as we have it is the result of crossing several primitive species, the problem becomes even more complicated. This is the case with the cotton plant, which has been cultivated in the Old World from a remote period and has, moreover, in later times been crossed with American strains. From this complex origin the cotton plant has acquired an extraordinary faculty of adaptation—it is in perpetual mutation. By a course of uncertain efforts or of fortuitous coincidences, races have been formed in the principal centres of cultivation differing widely from each other, and when industrial exigencies have suggested extending the culture of cotton to new districts the problem of choice among these races is much more difficult to solve than is generally supposed. For the second time since the French occupation of Algeria this question has come prominently forward. In 1853 one Hardy, who was then at the head of this department in Algeria, popularized a variety called *Georgie longue sire*, which seems to have been of a high economic value, but the origin of which is no longer discoverable. This variety was unfortunately lost to cultivation through two causes. The American War of Secession so much

reduced the supply of American cotton that any cotton, however indifferent, was sure to fetch a good price, and Algerian growers were no longer at the pains to select the pure Hardy variety. Again, after he had devoted himself to the work of the experimental garden for twenty-six years, Hardy was superseded and replaced by a commercial company, under whom the distribution of pure seed at once ceased. The duty of providing a race of plants which shall be absolutely suited to the cultural and economic conditions of the colony is again being recognized by the Government, and this article is a description of the efforts which are being made in this direction and of the experiments in hybridizing and grafting cotton which are being made.—*M. L. H.*

Crane-Fly, The Smoky. By James A. Hyslop (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 85, pt. vii.; Oct. 1910; 7 figs.).—The larvæ of the Smoky Crane-fly (*Tipula infuscata* Loew.) do much damage to pastures, hayfields, and clover. They are commonly known as "Leather Jackets," and they suck the juices of the roots and devour the plant tissue. The female fly deposits about 300 eggs, and the larvæ are frequently found in enormous numbers, as many as 200 having been counted in an area a little over 1 foot square.

Only one parasite is known, but many birds eat the eggs, larvæ, and adults. Probably the best way of treating an infested field is to plough the sod under in early autumn, and either sow corn or leave it fallow the ensuing summer.—*V. G. J.*

Creatine and Plant Growth. By J. J. Skinner (*Bot. Gaz.* vol. liv. No. 2, pp. 152-163; Aug. 1912).—Creatine and its anhydride, creatinine, are found in soils, and also occur plentifully in animal products, wine, meat, &c.

The author used wheat seedlings grown in solutions of various proportions of calcium, acid phosphate, sodium nitrate, and potassium sulphate. To 132 cultures, fifty parts of creatinine per million were added in sixty-six cases. The average increase in growth amounted to 9 per cent. Without other nitrogen the increase amounted to 36 per cent. With 8 ppm. of NH_3 creatinine produced 17 per cent. increase in green weight, but with higher proportions of NH_3 the increase sank to 8 per cent.

The plants supplied with creatinine do not respond so markedly to added nitrate (which seems to show that the plant can obtain nitrogen from this material).

Similar increases were shown when creatine was used.—*G. F. S. E.*

Dandelions, Spraying to Eradicate, from Lawns. By G. T. French (*U.S.A. Exp. Stn., New York, Bull.* 335, March 1911).—In some parts of the United States the method of spraying lawns with a solution of iron sulphate to eradicate dandelions is successful, but in New York, after experiments, it cannot be recommended.

C. H. L.

Diaspis pentagona and its Natural Enemy. By Ant. Berlese (*Rev. Hort. d'Alg.* p. 88; March 1912).—This insect reached Europe from Japan, and, having increased enormously, became sufficiently destructive to be under the ban of special laws. It was discovered, however, that its appropriate parasitic enemy had not accompanied it from its original home, but specimens of this *Piospaltella Berlesei* having been imported into Italy and increased by cultivation, all trees infested with the *Diaspis* may now be treated with *Piospaltella.* As a result of the new importation, the *Diaspis* has ceased to give any anxiety to horticulturists in Italy.—*M. L. H.*

Dioscorea, The Source of the Drug. By Harley Harris Bartlett (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 189; 1911).—*Dioscorea quaternata* (Walt.) Gmel.; *D. glauca* Muhl.; *D. paniculata* Michx. (var. *glabrifolia* Bartlett); *D. hirticaulis* Bartlett; *D. floridana* Bartlett.

According to Mr. C. G. Lloyd the rhizome of *Dioscorea* was first brought to the attention of botanic physicians by Dr. J. L. Riddell in 1835, though used before as a secret remedy. It is valuable in bilious colic; known also as wild yam, and colic root. The "true" wild yam (*D. paniculata*) becoming scarce, the "false" (*D. glauca*) had to be taken instead, but is not so satisfactory.—*C. H. L.*

Disinfection of Plants in Algeria (*Rev. Hort. d'Alg.* p. 117; April 1912).—A disinfecting station has been installed in Algiers for all imported seeds and plants which arrive in the colony. All plants are exposed in a specially constructed receptacle to the action of hydrocyanic acid, produced by treating cyanide of potash with sulphuric acid, and all cotton-seed coming from Egypt or America is soaked in a weak solution of corrosive sublimate.—*M. L. H.*

Dune Plants, Anatomy of. By Anna M. Starr (*Bot. Gaz.* vol. liv. pp. 265-305; Oct. 1912; 35 figs.).—The author has examined microscopically the stem and the leaf anatomy of a number of plants growing both on the dunes and in mesophytic (moderately wet and sheltered) situations. Careful measurements were taken of the thickness of the whole leaf, epidermis, depth of palisade, thickness of lower epidermis of cuticle; and for the stem, of the number of vessels, average diameter of vessels, thickness of walls of vessels and fibres and of cork, &c.

She finds that in the leaves of dune plants (xerophytic) there are heavier collenchyma (17 cases) and sclerenchyma (19 cases), the outer wall of the epidermis is heavier (18), the palisade more completely organized (17), and hairs more abundant (12 cases).

The leaves were all thicker in the dune forms, but with one exception. Bud-scales are also thicker, and in most cases the outer wall or cork. There is considerable seasonal variation in the structure of the leaves. In 1911 (an abnormally hot season) the

mesophytic form was sometimes thicker than the xerophytic form of 1909, but the xerophytic form of 1911 was correspondingly increased.

The vessels of the stem tend to be larger in the mesophytic, but more numerous in the xerophytic form. In the latter the walls of vessels and fibres are thicker. There is a more woody cylinder, an increase in mechanical tissue and in cork, as well as a slower growth in the xerophytic forms.

The paper is of great importance not only to ecologists, but as bearing on the theory of adaptations and of the general origin of plant-species.—*G. F. S. E.*

Elms in Illinois, What is the Matter with the? By S. A. Forbes (*U.S.A. Exp. Stn., Illinois, Bull.* 154; Feb. 1912; 6 plates, 4 figs.).—An affection of the elm tree is now prevailing over a large part of Southern Illinois, similar to one that destroyed many elms in the central part of the state thirty years ago. It is first noticed in early summer; the leaves cease their growth, turn brown, and fall. This is followed by the death of the branches; usually the higher branches are first affected, but the whole top soon goes, and in a year or two the tree is dead. The smaller terminal roots die and dry up progressively, the process extending to the larger roots and the base of the trunk. The disease and death of the tree is frequently accelerated by the larvæ of the many insects known to attack the elm.

The author points out that, although care and attention are always given to the various fruit trees, the shade and forest trees are more often left to shift for themselves, and if more care was exercised in pruning, feeding, and protecting generally, relieving them from the attacks of insects and surgically treating them to heal the wounds they have made, far fewer dead elms would be found.—*V. G. J.*

Exportation of Plants, &c.: Summary of Regulations (*Bd. Agr., Misc. Pub.* No. 13; 1912).—A useful summary of the import regulations in various countries trading with Great Britain concerning plants, seeds, and so on.—*F. J. C.*

Ferments, Concerning the Oxydizing. By Ch. Bernard and H. L. Welter (*Ann. Jard. Bot. Buit.* ser. ii. vol. x. pt. i. pp. 1-58; 1912).—The present communication is of a preliminary nature and chiefly concerned with an account of the methods employed. It consists of two parts, of which the first deals with the methods used for indicating oxydizing ferments in general, whilst the second section is concerned with the oxydizing ferments of the tea-plant in particular. The ferment, which has been called "oxydase," had already been studied by Chodat and Bach, who showed that this is not a simple body, but that it consists of (1) a peroxydase β, and (2) a peroxide.

In the case of the tea-plant the present authors find that a peroxydase, which is a substance with a constant and clearly expressed catalytic action, is to be met with in all parts of the plant. On the other hand, an oxydase does not occur as a staple and constant body.

Peroxides, however, are produced in the plant as intermediate products of the normal oxidations which take place in the living organism, and these peroxides give, in the presence of peroxydase, the reactions which are usually spoken of as those of "oxydase." It is a question of considerable importance whether the fermentation of the tea-leaves is due to the action of these oxydizing ferments or whether it is effected by micro-organisms. The authors do not attempt to answer this question in the present communication, but they point out that the peroxydases are particularly concerned in acting upon the peroxides produced in the respiratory processes of the living plant, and they incline to think that the peroxydases will probably be found to play only a secondary part in the post-mortem changes which take place during the preparation of tea.—*R. B.*

Ferns, Our Common. By C. T. D. (*Fern Gaz.* i. pp. 258-262, 284-288, and ii. pp. 12-14; March, June, Sept. 1912).—Brief notes on the British Lastreas, Aspleniums, and Athyriums, with their more noticeable recognition marks clearly defined.—*F. J. C.*

Fern Pest, A Serious. By Rev. K. Moore (*Fern Gaz.* ii. pp. 14-16; Sept. 1912).—A beetle, *Syagrius intrudens*, native of Australia, hitherto only known in greenhouses in Ireland, has recently proved very destructive in an outdoor fernery in Co. Dublin.—*F. J. C.*

Ferns, Spring Treatment of Hardy. Anon. (*Fern Gaz.* i. pp. 271-274; March 1912).—Recommends repotting and rearranging hardy ferns in spring and sowing spores then if not done in June or July.—*F. J. C.*

Fig Moth, The. By F. H. Chittenden, Sc.D. **Report of the Fig Moth in Smyrna.** By E. G. Smith (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 104; Nov. 1911; 16 plates, 4 figs.).—The larvæ of the Fig Moth (*Ephestia cautella* Walk) are practically omnivorous as regards stored foodstuffs, such as cacao-beans, nuts, cotton-seed, meal, rice, and particularly figs. The latter are damaged mainly before they reach America, the greatest injury being done *en route* from the orchards to the American ports. Cacao-beans infested with the larvæ have a bitter and disagreeable flavour; this probably accounts for the unpleasant flavour of some of the cheaper forms of so-called pure chocolate and cocoa. Barrett in 1875 described the moth as *E. passulella* from its frequent occurrence in dried currants. He noticed that it was locally common in dried fruit warehouses in London, and that it had the same hovering flight as the Indian-meal moth (*Plodia interpunctella*). In 1891 Mr. W. T. Pearce wrote a short note on this species, stating that the larvæ formed silk-lined passages through dried currants, and that they would be found on opening almost any case of currants. He also mentioned a small black ichneumon parasite.

The authors suggest many methods of control and prevention, but the co-operation of both the Governments concerned, in prompt and

decided action, is necessary if any improvement is to be expected in the present methods of drying and packing figs.—*V. G. J.*

French Prunes or Bordeaux Prunes. By C. J. Carmody (*Jour. Dep. Agr., Victoria*, pp. 809-814, Dec. 1911).—Grown at Agen, capital of the department of Lot-et-Garonne. This district of France is cool and moist, and the fruit in consequence has a thin skin. The only variety grown is 'Prune d'Ente,' a sweet and thin-skinned black plum with a very small stone. The artificially heated drier or evaporator appears to be absolutely essential to the production of high-class prunes, which are half-cooked or stewed in their own steam. Fifty years ago the prunes used to be dried in the ordinary baker's oven after a batch of bread had been baked. The prune-grower, by drying his own fruit, employs his workmen at a time when other work is not urgent, and he uses up pruning-wood of little value. The 'Prune d'Ente,' when very ripe and very rich in sugar, is difficult to carry far, owing to the thinness of its skin. The size of the ovens is about 8½ feet long, 5 feet wide, and height above fire-box 6 feet. The cost is about £15, exclusive of brickwork. The ovens consist of a fire-box, a drying-chamber situated immediately over it, and a truck running on rails, on which the trays containing the fruit are stacked. This movable truck permits the rapid withdrawal of the fruit when it needs cooling, as it usually does twice during the drying process.

Two principles are observed constantly: (1) The temperature should never descend after the moment when, the prunes having been placed in the oven, equilibrium is established; the temperature should rise, or else remain stationary if it be up to the required degree. (2) Moisture should never condense on the thermometer pane; if a deposit commences to form, the air-entrance must be opened so as to carry away the surplus steam.

The work comprises three phases:—

Wrinkling.—The empty oven is first heated for about an hour, with all air-entrances closed, so as to reach 212° F. The truck, loaded with fruit, is then wheeled into it. The thermometer descends progressively to 140° at the close of an hour. Air-entrances are gradually opened to carry off surplus moisture. Two hours after the introduction of the fruit the door is slightly opened to see if the prunes have not swelled too much. If leakage of juice is feared, the truck is taken out for five minutes so that the skin may acquire strength. The truck is wheeled in once more, and the thermometer falls again somewhat, reaching 129-133° F. Under these conditions the fruit may be left six hours without withdrawal and without inspection. The fire should be moderate enough to prevent the thermometer rising above 131° F. After six hours the truck is taken out for an hour.

Seconding.—While the fruit is exposed to the outside air, the fire is tended so as to raise the temperature to 176-194°. The truck is once more wheeled in; juice will not run if care is taken to open the two air-entries fully, so as to evacuate the abundant steam which is given off. The fruit may once more be left in this state for another

six hours, at a temperature of 140-149°. At the commencement of the sixth hour it is raised to 158°. During the six hours the door is opened once or twice to see if the prunes acquire a good brown colour and gloss. If there is no gloss, the temperature is too low: the fire should be forced. At the close of six hours the prunes commence to wrinkle. The truck is taken out again and once more left for an hour in the open air.

Finishing.—As soon as the truck is removed the air-entrances are closed and the temperature is raised to 212° F. The truck is again introduced, and the temperature falls to 140°. The air-entrances remain closed during about an hour, until the thermometer-pane shows slight moisture. The air-entrances are then opened to carry off the excess of steam. For six hours heating is continued, so as to gradually reach 167° towards the fifth hour. The air-entrances are constantly open during the last period of finishing, so that moisture may not soften the prune, which would cause delay and reduce quality. Towards the sixth hour the door is opened, and the fruit is sometimes left for another hour in the oven, so as to ensure complete drying. In a recent trial 1,119 lb., in two charges, dried down to 437 lb. prunes, or 35.7 per cent. of the fresh fruit; 1,054 lb. of wood were burnt, or 241 lb. per 100 lb. of finished prunes.—*C. H. H.*

Frost Injury. By D. Reddick (*U.S.A. Fruit Growers' Association, New York*; Proc. 1912).—A serious amount of damage was done by frosts to fruit-trees in 1911, of which this is an account. The symptoms of the damage were feeble growth, sickening, yellowing, and finally death of foliage. This damage was sometimes confined to one side of the tree. Close inspection revealed canker spots either near base or in crotch of tree. In peaches and cherries gumming occurred. In young apples and pears the bark, at first black, changed colour to yellow or brown and clung tightly to the wood. On vines swellings somewhat like those produced by "crown gall" appeared during the summer. A discussion of the general effects of frost is given, and it is said that a moderate cutting-back prevents a great amount of damage.—*F. J. C.*

Geotropy and Statoliths. By Arthur Block (*Beih. Bot. Cent.* Bd. 28, pp. 422-452; 6 figs.).—The author gives results of a number of experiments with *Lepidium*, *Helianthus*, *Vicia*, *Trifolium*, and *Setaria* seedlings, which show that the use of potash-alum (to remove starch) either produces traumatic curvatures, that can easily be mistaken for geotropic curvatures, or may injure the roots.

No geotropic curvature was found when the roots were freed of starch. Other bodies in the roots occasionally produced geotropic movement. The statolith theory is not therefore contradicted by the experiments of Pekelharing.—*G. F. S. E.*

Ginseng, The Diseases of, and their Control. By H. H. Whetzel and J. Rosenbaum (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.*

250; April 1912; figs.).—The following diseases of ginseng (*Panax quinquefolium*) are described, and suitable methods of dealing with them outlined: Alternaria blight caused by *Alternaria Panax*, Whetz.; mildew due to *Phytophthora cactorum*; anthracnose due to *Vermicularia dematium*; leaf spots due to *Pestalozzia funerea* and to cultural mistakes; damping off caused by *Rhizoctonia*, *Phytophthora cactorum*, and *Pythium debaryanum*; wilting brought about by the fungus *Acrostalagmus* sp., and by a species of *Fusarium*; root knots due to the eelworm *Heterodera radicicola*; root rots due to *Thielavia basicola* and to *Sclerotinia Libertiana* and *S. panacis*. Soil sterilization is recommended as a method of dealing with eelworms and soil fungus troubles.—*F. J. C.*

Gooseberry Mildew in Kent, American (*Jour. S.E. Agr. Coll.*, 1911; p. 31).—Gives an account of the prevalence of this disease in Kent in 1911.—*F. J. C.*

G ape Leaf-Hopper and its Control, The. By F. L. Hartzell (*U.S.A. Exp. Stn., N. York, Bull.* 344; Feb. 1912; 4 plates, 3 figs.).—The author gives a description of the insect with life-history and also describes an automatic sprayer. He says that a nicotine solution diluted until there is 2/100 of 1 per cent. nicotine in the spray material will kill the insects, if sufficient is used, at a pressure of 125 to 150 lb. to the square inch. The under-sides of the leaves must be drenched with the spray.—*V. G. J.*

G ap Leaf-Hopper, Spraying Experiments against the. By Fred Johnson (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 97, pt. i.; March 1911; 2 plates, 5 figs.).—The Grape leaf-hopper (*Typhlocyba comes* Say) is a familiar enemy to most vine-growers. In the Lake Erie Valley the damage done by it has hitherto been confined to limited areas, usually adjacent to rough lands and woodlots, but in 1910 it greatly increased and spread. Therefore, growers must be prepared to combat it. Experiments show that spraying with black leaf-tobacco extract 1 gallon to 1750 gallons of water is effective if thoroughly applied.—*V. G. J.*

Grapes, A Precaution before Eating (*Rev. Hort. Belge*, p. 324; Oct. 1, 1911).—A warning to consumers that it is wise to wash all commercially grown fruit, and especially grapes, before bringing them to table. Several deaths have been reported from Perpian, caused by eating grapes which had been sprayed with poisonous insecticides.—*M. L. H.*

Grasses, A Sclerotium Disease of Common. By A. B. Stout (*U.S.A. Exp. Stn., Wisconsin, Research Bull.* 18; June 1911; 8 plates).—A disease attacking several species of common grasses, many of which are British, is described and excellently figured. The grasses become dry, rigid, and crookedly bent, while upon the leaves

felts of mycelium develop, followed by sclerotia. The leaves are particularly liable to attack; the buds, stems, and roots less so. The mycelium persists in the soil, and infection comes from the subterranean to the aerial portions of the plant. The mycelium appears to be sterile, nor has spore formation from the sclerotia been observed. The fungus is European in distribution as well as American, and is *Sclerotium rhizodes*, Auersw.—*F. J. C.*

Growth of Wheat Seedlings. By J. F. Breazeale and J. A. Le Clerc (*U.S.A. Dep. Agr.*, *Bur. Chem.*, *Bull.* 149; March 1912; 8 plates).—This is a physiological study on the effect of the reaction of the culture medium on the growth of wheat seedlings undertaken primarily to determine whether or not the results obtained in practical agriculture can be explained in the laboratory from a purely scientific standpoint. The experiments were carried on in nutrient solutions and in distilled-water cultures, thus eliminating the disturbing factors due to the presence of soil grains. There were solutions of sodium nitrate, potassium chloride, potassium sulphate, hydrochloric acid, and sulphuric acid, and also of each of these with calcium carbonate added (p. 6). The dry weight of the roots was increased in every case by the addition of calcium carbonate (p. 11), but the dry weight of the tops was not necessarily greater, though they were larger and presented a much better appearance, thus indicating that the appearance of the stems of young wheat seedlings is not always a criterion of the vigour of the plants and, therefore, of the probable yield of the mature crop (p. 9). The experiments are considered to have shown very clearly the extent to which selective action is practised by the roots. Solutions which at the beginning of the experiment contained 150 parts per million of potassium sulphate (87 parts of SO_4 and 63 parts of potash per million) were found at the end to have lost all their potash, while only 30 parts per million of SO_4 had been absorbed (p. 11). Thus the solution becomes acid, and root development is injuriously affected.

It has been found that the enzymic activity of a wheat seedling is greatest during the first few days of its growth, this being especially true of the oxydases and peroxydases of the root tip, and the effect of toxic bodies upon this is an important factor both in agricultural practice and in scientific research. This was shown when growing a second crop of seedlings in the same solutions after the first crop had been removed, the acidity of the solutions to which the calcium carbonate had not been added having developed to such an extent that in the second crop the action of the enzymes was practically inhibited by it, and the plants were unable to tide over this critical period (p. 14). In the second crop the alkalinity of the solution (the addition of calcium carbonate) increased both the green and the dry weight of the tops, while the weight of the residual seeds was diminished, the acidity of the solution preventing the food material that was stored up in the seed from being transported into the plant.—*A. P.*

Guatemala Plants. By John Donnell Smith (*Bot. Gaz.* vol. liv. pp. 235-244; Sept. 1912).—New species of *Rigiostachys*, *Eugenia*, *Anquria* (2 spp.), *Gurania*, *Alloplectus* (3 spp., with key to others), *Besleria*, *Phyllanthus*, *Hieronyma*, *Croton* (2 spp.), *Acalypha*, *Conceveiba*, and *Ampelocera*.—*G. F. S. E.*

Hawaii Annual Report Agr. Exp. Stn. for 1910. By E. V. Wilcox (May 1911; illustrated).—It being impossible to construct and carry on demonstration farms on each island, a plan has been adopted, which works well, of selecting the holding of the most progressive farmer in each locality and, with his co-operation, carrying out the improved methods of cultivation that it is thought desirable to introduce, with careful checking of results in each case.

The soil in Hawaii, being highly manganiferous and ferrous, requires mechanical improvement rather than actual fertilizing.

In the case of pineapples, the phosphatic manures seem to be beneficial, as tending to render the manganiferous salts less soluble, but lime, on the contrary, combines with the latter and forms the injurious higher oxide of the mineral. The sugar-content of pineapple is proved to be supplied entirely from the leaves, and when cut green, it remains stationary, "ripening" merely softening the tissues of the fruit, and not increasing its sweetness. They should therefore be cut only when the fruits have turned yellow about a quarter of their length.

Rice benefits from manuring in its quite early stages, and nitrogen has more value for it than potash and phosphates. If given in the form of sulphate of ammonia, nitrogen has a marked beneficial effect, whereas nitrate of soda appears to have none.

The chief cottons grown are Caravonica and Sea Island, the former being preferable on account of its upright habit of growth, whereas the very productiveness of the latter is a disadvantage, as the weaker stems cannot support the weight of the bolls, which are apt to rot from lying on the ground.

With rubber, clean cultivation would seem to be far more important than fertilizers. Trees which had received clean cultivation since planting were larger at two years of age than six-year-old trees under no cultivation.

Arsenite of soda as a spray was used to keep down weeds where it was too rocky to cultivate.

The Ceara rubber grows more rapidly in Hawaii than Hevea, and will probably be more extensively planted.—*C. H. L.*

Hawthorn Seeds, After-Ripening of. By Wilmer E. Davis and R. Catlin Rose (*Bot. Gaz.* vol. liv. pp. 49-62; July 1912).—The authors point out that freezing, and sometimes freezing and thawing, accelerate the ripening of various seeds. *Crataegus mollis* seeds do not usually germinate till two, or even three, years after maturity. The authors found no germination for months, even after carpellary

walls had been removed, and very little with seed-coats removed at ordinary temperatures.

But when carpels were removed (and still better when seed-coats were removed) and the seeds were placed on wet cotton in an ice-chest at 5° to 6° C., and even at 0° C., for from 73 to 96 days, and then removed to a greenhouse or water-bath at 10° to 12°, a large proportion (from 50 to 80 per cent.) germinated.

The loss seemed mainly due to injury in the process of removing carpels and seed-coat, which is a difficult matter. No germination was obtained when seeds were kept dry or under water. Ether had no effect. Without oxygen and with hydrogen either none or very few germinated. At temperatures of −2° to −3° C. there was no germination. The authors consider that it is because water and oxygen do not penetrate to the hypocotyl that germination is delayed under ordinary conditions.—*G. F. S. E.*

Hickory Trees, The Dying, Cause and Remedy. By A. D. Hopkins (*U.S.A. Dep. Agr., Bur Entom., Circ.* 144; Jan. 1911; 4 figs.).—Within the last ten years a very large number of hickory trees have died in various parts of the Northern States, from Wisconsin to Vermont, and southward through the Atlantic States to Georgia. The primary cause of death has been found in most cases to be the hickory bark-beetle (*Scolytus quadrispinosus*). The adult beetles feed at the base of the petioles, causing the leaves to fall prematurely. They bore through the bark and make short vertical galleries where they deposit their eggs, and the larvæ hatching from them excavate radiating food burrows which serve to girdle the tree or branch, which causes injury, if not death, to the tree. Several methods of control are suggested by the author, the principal one being to cut off and burn all infested branches so as to destroy the broods before they emerge in May.—*V. G. J.*

Hybrid Seed, Increased Yields of Corn from. By G. N. Collins (*U.S.A. Dep. Agr. Year Book*, pp. 319-328; 1910).—Uniformly favourable results have been obtained from ten independent experiments in crossing sweet corn. The first-generation hybrids have shown themselves to be almost invariably more productive than the parent strains. On the other hand, their progeny do not show the same vigour; therefore, to obtain the increased yields, it is necessary to renew the crossing of pure strains each year.—*C. H. L.*

Impatiens, Polarity of. By A. Ursprung (*Beih. Bot. Cent.* Bd. 28, pp. 307-310).—The author finds that *I. Sultani* exhibits the same polarity regarding the formation of roots on the stem as has been shown for other species of this genus. In all cases the plant endeavoured to form its roots as near to the base as possible.—*G. F. S. E.*

Indian Meal Moth, The, and "Weevil-cut" Pea-nuts. By C. H. Popenoe (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 142; Sept.

1911; 1 fig.).—The Indian meal moth (*Plodia interpunctella* Hbn.) is a common and well-known pest, frequenting places where food-stuffs and cereals are stored, the larvæ feeding on meal, flour, and grain, also dried fruits, nuts, chocolate, and seeds.

When the shells of pea-nuts are broken by careless handling or defective machinery the insect obtains entry to the kernel of the nut and does considerable damage in the storehouses.

Heat and fumigation are two very successful remedies. A temperature of 120° for at least six hours is fatal to the insects, and fumigation with hydrocyanic acid gas or carbon bisulphide gives excellent results.—*V. G. J.*

Insecticides (*Rev. Hort. d Alg.* p. 157; June 1912; figs.).—Some formulæ of insecticides and descriptions of various mechanical contrivances for use in spraying or fumigating trees and shrubs. The insecticides include several containing petrol, with substances such as flour or clay, which tend to keep it thoroughly mixed with the water during use, and several, combined with seal oil, resinous soaps, &c., which give a coating of varnish to the leaves and so trap the insects without injuring the vegetation.

The first group includes the following:—

A. 1 kilo. damaged flour.
5 litres petrol.

Carefully stir the flour into the petrol. When this forms a paste, add, while stirring the mixture, 20 litres of water, boiling if possible; stir energetically; make up to 100 or 200 litres as wanted.

B. 2 kilos. dry clay.
5 litres petrol.

Make a paste with the clay and water; add the petrol smoothly mixed; add little by little 10 litres of water. When thoroughly mixed add 100 to 200 litres of water as wanted.

In Algeria on many farms a certain number of the fruit of the *Sapindus* are available. A decoction of this fruit makes a good and easily made emulsion as follows:—

Petrol	5 litres
Sapindus	500 grammes
Water	25 litres

Pour the petrol little by little into the warm decoction of Sapindus; stir violently to obtain the emulsion, which comes like a white cream. This emulsion keeps well and may be diluted with 100 or 200 litres of water.

For a soap emulsion use:—

Seal-oil soap or soft soap	500 grammes
Boiling water	4 litres
Petrol	8 litres

Dissolve the soap by boiling; add the petrol, and pump at the mixture until the creamy liquid shows no free petrol on its surface.

If the water is chalky, precipitate the chalk first with a little soda, otherwise the chalky soap will obstruct the spraying machine. This emulsion may be employed in a strength of one to from fifteen to twenty-five of water. Petrol emulsions should not be allowed to accumulate at the foot of a tree. Mixtures containing caustic soda must be carefully prepared to avoid danger to the operator. The following has been found useful against red spider:—

Resin	2,500 grammes
Caustic soda	1,250 ,,
Fish oil	½ litre
Water	100 litres

Put these ingredients in a pot with two litres of water; boil for two hours, adding more water until the mixture becomes coffee-colour. Add the rest of the water. This must be diluted for use as a spraying mixture.

An excellent insecticide may be made from one of the two following formulæ:—

A.	Fir-tar	1 kilo.
	Caustic soda	1 ,,
B.	Alkaline cresylate	1 to 2 kilos.
	Ordinary carb. of soda	500 grammes
	Water	100 litres

Dissolve the carb. of soda in the water; stir in the cresylate.

Soft soap or, better still, fish-oil soap may be added.

A mixture which gave good results in a badly infested orange garden in Spain was composed as follows:—

Seal oil	2,000 grammes
Fish-oil soap	1,000 ,,
Caustic soda	250 ,,
Tar oil	1,500 ,,
Water	950 litres

Boil the other ingredients with a little of the water. When the liquid is smoothly mixed, stir in the rest of the water.—*M. L. H.*

Insects, Noxious, Natural Defences against. By A. E. de Mazières (*Rev. Hort. d'Alg.* p. 5; Jan. 1912; figs.) and by Dr. L. Trabut (*Rev. Hort. d'Alg.* p. 168; June 1912; figs.).—The first of these articles gives an illustrated and descriptive list of noxious insects which are to be dreaded in Algeria, and of the most active enemy of each among its own order. These insect allies of the horticulturist are of two kinds—the predatory ones, which devour noxious insects, and the parasitic ones, which are developed in the bodies of such insects or of their larvæ. Dr. Trabut's article is the first of a series on some imported insect pests which have multiplied alarmingly through the absence of their parasites, which were left behind in their original homes. The writer gives the names of these insect antidotes, and describes how they may be imported and naturalized.—*M. L. H.*

Lavender Cultivation. By J. Knight (*Jour. Dept. Agr., Victoria*, x. p. 316; May 1912).—An account of the cultivation of the lavender on a commercial scale.—*F. J. C.*

Layering. By A. van den Heede (*Rev. Hort. Belge*, p. 312, Oct. 1, 1911; p. 329, Oct. 15, 1911; p. 345, Nov. 1, 1911; figs.).—A series of articles on every possible form of layering, with careful diagrams and illustrations and exact descriptions of how each different operation is to be performed.—*M. L. H.*

Leguminosae, Shape of Flower. By Otto Schüepp (*Beih. Bot. Cent.* Bd. 28, pp. 195-246; 11 plates and 9 figs.).—The author shows that many of the peculiarities in the flowers of *Lathyrus* and *Vicia* can be explained (at least in part) by the different rates of growth of calyx, corolla, stamens, and style, and by the interferences which limit the growth of the whorls owing to the struggle for space within the bud.

It is impossible to give in brief his results (though they are of great interest), because they deal with minute details which can only be adequately illustrated by figures.

Amongst the most important factors in the shaping of the flowers of *Vicia Lathyrus* are the following:

The petals grow more rapidly than the other parts in the early stages of development, but are hindered at first by the calyx and then (so far as regards keel and wings) by the resistance of the andrœcium, which, being a compact cylinder, interferes with the unfolding of the petals.

The growth of the lower median line of the carina is quicker than that of the midribs of the wings, and the lowest part of the style also grows more rapidly than its upper part. This, and the manner in which these parts are hindered by the standard, leads to the upward curvature of keel, wings, and style.

This resistance of the standard produces tensions in the claws of the other petals, and induces the formation of grooves and ridges on the upper edges of wings and keel.

The experiments made by the author in artificially checking expansion illustrate his deductions.

In each whorl of the flower it is *usually* the anterior part (the under side) which is favoured and grows fastest. In some species of *Lathyrus* the left flank of the style grows the most rapidly.

The axis of the flower is at first delayed, but later on the central part develops greatly in diameter, leading to the separation of the attachment places of the petals.

The adaptations of the floral parts are, therefore, in large part explained by the mechanical consequences of growth.—*G. F. S. E.*

Leguminous Crops for Hawaii. By F. G. Krauss (*U.S.A. Exp. Stn., Hawaii, Bull.* 23; September 1911; 8 plates).—Several varieties of alfalfa are being grown at this Station with a view to

determine their relative value under Hawaiian conditions. It is a crop of very quick growth in this climate, and the number of crops harvested annually ranges from twelve in the most favourable situations to six at an altitude of 4700 feet (p. 14). The soy bean is recommended as one of the most desirable crops to grow on account of the nutritive value of the foliage, its early maturity and heavy seeding, together with the highly concentrated value of the crushed or ground bean for both feeding and culinary purposes (p. 23). It is also a good subject for green manuring. It is stated that in Japan and other Oriental countries this crop is responsible to a greater extent than almost any other for the maintenance of their soil fertility (p. 24). About 100 varieties have been tested at this Station.—*A. P.*

Leopard Moth, The. By W. E. Britton and G. A. Cromie (*U.S.A. Exp. Stn., Conn. Bull.* 169; Nov. 1911; 8 plates, 6 figs.).—The larvæ of the Leopard Moth (*Zeuzera pyrina* Linn.) cause much damage to shade trees by boring in the branches just under the bark and cutting large galleries, often across the grain, thus girdling them. Dead branches in the tree-tops are a sign of attack. The female moth lays eggs in crevices in the bark or near buds about July, and the larvæ hatch in a few days. During October the borers go deeper into the wood and remain through the winter. They pupate in their burrows the second spring, and before the moth emerges the pupa works itself partly out of the opening and the adult flies away, leaving the empty case protruding from the burrow.

Removing infected branches; injecting carbon bisulphide into the burrows and stopping the opening; probing with a hooked wire for the larvæ, are some of the methods of control.—*V. G. J.*

Lilac, To Force. By A. Buyssens (*Rev. Hort. Belge*, p. 229; July 15, 1911; plates).—A description of the three methods of forcing lilac for cut blooms at Christmas and through the winter, employed on a large scale in Belgium. The plants, specially grown and trained for the purpose, are either lifted and planted out in forcing-houses, or movable span-roof hothouses are placed over beds of them in their growing positions, or the plants are forced in pots. Minute directions are given for each of these methods. The varieties forced in Belgium are principally 'Marie Legraye' and 'Souvenir de Louis Spath.'

M. L. H.

Lime-Sulphur Wash on Gooseberries, Experiments with. By D. Eyre Baxter and E. S. Salmon (*Jour. S.E. Agr. Coll.*, 1911; p. 23).—'Whinham's Industry' suffered no injury when sprayed with lime-sulphur of sp. gr. 1.005; 'Berry's Early' during very hot weather, and when weather became very hot soon after spraying, suffered serious defoliation.—*F. J. C.*

Linden Moth, The Snow-White. By G. W. Herrick (*U.S.A. Exp. Stn. Cornell, Bull.* 286; Nov. 1910; 5 figs.).—To check attacks

of this moth (*Ennomus subsignarius* Hübn.) the English sparrow was introduced from Europe, and so well did it do its work that for many years almost nothing was heard about it as a shade-tree pest. In 1907 it again appeared, and in 1910 was as prevalent as ever, and it is quite possible that it may become a serious pest of fruit trees.

Spraying with arsenite of lead, 3 lb. to fifty gallons of water, while the caterpillars are small, would seem to be the best remedy.
V. G. J.

Lychnis and Shirley Poppy, Colour Factors in. By George Harrison Shull (*Bot. Gaz.* vol. liv. pp. 120-135; Aug. 1912).—When a colour character is inhibited, the result is a "dominant white," at least if inhibition is complete, but there are also recessive whites, and dominant whites are not necessarily due to the above reason. Thus, for example, indigo blue ($C_{16}H_{10}N_2O_2$) may become in alkaline solutions indigo white ($C_{16}H_{12}N_2O_2$), and anti-enzymes may exist which will prevent the action of such colour formers as tyrosin.

The author has grown 660 families of *Lychnis diocia*, and has always found hitherto that white is recessive to colours; all crosses of white-flowered individuals have given white descendants. But a cross between a white (male) *Melandrium album* Garcke from Baden and a Cold Harbour (American) form yielded seventy-seven offspring, all of which were reddish-purple. A cross between *Melandrium rubrum* Garcke (male) and *M. album* yielded twenty-three white and three purple flowers.

In Shirley poppies, the white margin is found to be dominant over its absence, but a red-violet margined plant produced three families with no margin. The dark red-orange body-colour of the wild *Papaver Rhoeas* is epistatic to all the body-colours of the many garden forms. Doubleness is also dominant.

The white colour of Shirley poppy (with yellow stamens) seems to be nearly always dominant, only twenty-five out of 559 descendants being neither pure white nor white with traces of red. A cross of two dark red plants yielded sixty-eight white and seventy pigmented (less dark than their parents), and similar results were found in other cases of striated-petal parents or striated-petal and plain red parents.

This ' dominant white " has hitherto not appeared from red-orange or light violet-red parents, only from red or striated parents. The inhibiting factor seems to affect only pure spectrum red.

The author discusses the supposed inhibiting factors by which he explains the above results.—*G. F. S. E.*

Mango Weevil, The. By C. L. Marlatt (*U.S.A. Dep. Agr. Bur. Entom., Circ.* 141, June 1911; 2 figs.).—The most serious insect pest in Oriental countries is the mango weevil (*Cryptorhynchus mangiferae* Fab.), a relation of the boll, and chestnut weevils. It is likely to be introduced into Florida in mango seeds. These are largely infested with it, and the prospective mango industry of that country is threatened. Inasmuch as this insect passes its entire

development within the seed, insecticides and fumigation will not touch it; therefore, the only remedy the Bureau can advise is to collect and destroy all fallen and supposedly infested mangos.

V. G. J.

Marketing Fruit. By Hon. W. K. Newell (*U.S.A. St. Bd. Hort. Oregon Rep.* 1909-10, p. 75).—Oregon is in a position to become the leading apple and pear producing State in the Uuion, but to bring the industry to its highest perfection needs co-operation, rigid uniformity in grading, packing, labelling, &c., and above all, to suit the product to its market. The German method might be followed, that of sending their best salesmen to hunt far and wide for markets, and to find just what the market wants; the style and price of goods, and how they want them packed, terms of payment, &c., and everything in the remotest way connected with the deal. The English and American way has too often been to send just what they were growing or could not sell at home, or what they thought the foreign market ought to want—and let it go at that.—*C. H. L.*

Markets for Oregon Fruits, European. By Hon. H. B. Miller (*U.S.A. St. Bd. Hort. Oregon, Rep.* 1909-10, p. 118).—Of all the European markets Great Britain promises to be Oregon's best customer. The annual importation of apples alone into Great Britain amounts to 10 million dollars, and pears between 2 and 3 million dollars.

In looking at the tremendous imports of fresh fruits into Great Britain, it must be borne in mind that there is no month in the year when they are not importing fresh fruits from some country. Fresh pears, peaches, and apples from South Africa in February, March, April; and from Australia, Tasmania, and New South Wales in May, June, July.

Fruit from Oregon compete with those from the Eastern U.S., Canada, France, Belgium, Spain, Portugal, and Holland. Fruits to the value of $53,000,000 per annum are imported into Great Britain free of duty, with an additional large importation that *do* pay duty.

France imports very little fruit, being practically self-supporting in this respect.

Germany ought to offer a good market to Oregon fruits if properly exploited. The writer says, "It has the appearance of the most thrifty, industrious, and prosperous country in Europe . . . extremely progressive and developing in a most substantial way."

The American Consul at Belfast gives his countrymen some very good advice as to how to enlarge their European markets, and so make their products known and appreciated for good quality that when the cost of transport is halved on the opening of the Panama Canal they will be able to benefit by the inevitable increase in trade, and hold this market against all comers.

Judicious advertising, reduction in prices, and proper organization are chief amongst his counsels.—*C. H. L.*

Melon Aphis, How to Combat the. By M. H. Swenk (*U.S.A. Exp. Stn., Nebraska, Bull.* 34; June 1911; 1 fig.).—This aphis (*Aphis gossypii* Glover) is a very injurious pest to cucumber and melon plants. The loss of crops from it in Nebraska alone amounts to several thousands of dollars annually. The same aphis is a common pest of cotton in the Southern States, and occurs in the West Indies, Mexico, Brazil, South Africa, and Australia. It is probably of tropical origin.

Spraying with Black-Leaf Tobacco extract 1 to 50 parts of water, and fumigation with carbon bi-sulphide, are recommended.—*V. G. J.*

Mint Cultivation. By J. Knight (*Jour. Dept. Agr., Victoria*, x. p. 361; June 1912).—Directions for starting and maintaining plantations of black mint (*Mentha piperita*).—*F. J. C.*

Mycotrophic Plants, Nutrition of. By H. Weyland (*Jahrb. f. wiss. Bot.*, Bd. li. pp. 1-80; 1912).—In this paper a comparison is instituted between the nutrition of ordinary green plants and those which obtain their food more or less completely from organic sources. The author's chief method is that of microchemical testing for urea and allied nitrogenous substances, which are produced by fungi in their metabolism. He finds that urea occurs in a number of mycotrophic flowering plants—plants which obtain more or less of their food by the aid of a root-inhabiting fungus (mycorrhiza)—and especially in the saprophytic orchids (*Listera*, *Ophrys*, *Gymnadenia*, *Neottia*, *Epipactis*, &c.). On the other hand, urea was not present, at any rate in recognizable amount, in a number of other plants with mycorrhiza, nor in the Leguminosae (which may be explained by the fact that these plants assimilate nitrogen from the amosphere by means of their tubercle bacteria); while urea was found in a few non-mycotrophic plants growing in rich humus—in this case, it was probably absorbed directly from the soil. The absence of urea from plants with external (ectotrophic) mycorrhiza is explained by the author on the ground that the relationship between fungus and higher plants in such cases is not so intimate as in the case of the orchids mentioned above and other plants with internal (endotrophic) mycorrhiza.

Weyland also investigated the occurrence and distribution of phosphorus, potassium, and calcium in various autotrophic and mycotrophic plants. He found the fungal hyphae in the roots of the saprophytic orchids, and the tissue of the roots themselves, particularly rich in phosphorus, as is also the case with the bacterial nodules of Leguminosae. The roots of saprophytic orchids are also strikingly rich in potassium and in calcium—the abundance of the latter metal suggests that it serves for the neutralization of the acids produced by the mycorrhizal fungus.—*F. C.*

New Mexico, Plant Geography of. By J. R. Watson (*Bot. Gaz.* vol. liv. pp. 194-217; Sept. 1912; 7 figs.).—The northern half of

New Mexico lies under the 35th parallel and at altitudes of from 5000 to 11,000 feet. The climate is arid; rainfall at Albuquerque 7.43 inches, but with much heavier precipitation in the mountains.

Along the Rio Grande, where the water-table is never far from the surface, there occur associations of cotton-wood (*Populus Wislizenii*) and *Juncus Houttuynia* (*J. balticus*), the latter sometimes being overgrown and occupied by the former.

The recent valley of the Rio Grande is cut out of an ancient river terrace or "mesa," which extends 9 to 10 miles eastwards to the mountains and is apparently 100 to 300 feet above the present valley. This mesa was originally a grassland, and is so still when not over-grazed, but is now often a *Gutierrezia* (*Chrysothamnus*) association with *Opuntia*, *Yucca*, many annuals (summer and winter), and perennials, with underground stores of moisture. The last blossom after the rains. In very dry years *Gutierrezia* blooms only in the mountains or along trails where the dust of the trail conserves the moisture.

Many interesting xerophytic associations are found on the dry dissected edges of the mesa or in the side valleys, which are sometimes sandy or alkaline. Towards or on the mountains, at about the lower limit of the winter snow, a juniper (*Juniperus monosperma*) and pinon (*Pinus edulis*) formation replace the *Gutierrezia*.

Next comes the transition zone of yellow pine (*P. ponderosa*) which marks a sharp and complete change of flora and is more closely allied to that of Ohio than to that of the mesa only a mile away. It coincides with the region of deep winter snow, and occasionally gives place to mountain meadows. The Douglas spruce formation—a dense forest—covers slopes facing north at altitudes above 8000 feet (*Pseudotsuga taxifolia*, *Berberis*, *Galium*, *Monarda*, *Oxalis*, *Corydalis*, *Clematis*, *Aquilegia*, *Stellaria*). This is confined to the most mesophytic places. Engelmann's spruce is found on the highest and most exposed parts of North Mountain. The summits are covered with chaparral (oak scrub), with yellow pine at lower and *Abies concolor* at higher levels.

The influence of moisture is very distinct in this arid district. *Fallugia paradoxa* occurs in the side valleys of the mesa and also on steep south-westerly slopes over 9000 feet on the mountains—that is, in the least xerophytic part of the valley and most xerophytic habitat of the hills.—*G. F. S. E.*

New Plants of the Rocky Mountains. By Aven Nelson (*Bot. Gaz.* vol. liv. pp. 136-151; Aug. 1912).—The author describes new species of *Sisyrinchium*, *Eriogonum* (2 spp.), *Polygonum*, *Loeflingia*, *Parrya*, *Taraxia*, *Cicuta*, *Cynomarathrum*, *Phacelia*, *Gilia*, *Cryptantha*, *Pentstemon*, *Castilleja*, *Lesquerella*, *Astragalus*, and *Mertensia*

G. F. S. E.

Nitrification, Influence of Moisture upon. By J. W. Paterson and P. R. Scott (*Jour. Dep. Agr., Victoria*, x. p. 275; May 1912)—

It is shown that in soil containing three times more water than its average air-dry condition, nitrification is at a standstill. The optimum water content for nitrification is between 14 and 18 per cent. Summer working of fallow land so as to retain moisture may thus have an important result in the production of nitrates.—*F. J. C.*

Nitrogen-fixation in Soils in Colorado. By W. G. Sackett (*U.S.A. Exp. Stn., Colorado, Bull.* 179; June 1911; figs.)—*Azotobacter Chroococcum* appears to be the chief nitrogen fixing organism in the Colorado soils. It develops a dark brown pigment in the presence of nitrates, imparting that tint to the soil, nitrites causing its production to a less degree. Nitrification goes on in all the soils investigated except where limited by excessive soil moisture.

F. J. C.

Nitrogen, Fixation of, in Colorado Soils. By W. P. Headden (*U.S.A. Exp. Stn., Colorado, Bull.* 178; June 1911; figs.).—This is a chemical study of the rate of nitrogen fixation in some soils of Colorado and deals with the rate of nitrification under different conditions of moisture.—*F. J. C.*

Nitrogen-Gathering Plants. By Karl F. Kellerman (*U.S.A. Dep. Agr. Year Book*, pp. 213-218, 1910; illustrated).—It is now common property that leguminous plants have nitrogen-fixing nodules upon their roots, but probably not so generally known that some non-leguminous plants also have this characteristic, among them being the Alder, *Ceanothus americanus*, *Elaeagnus argentea*, *Comptonia peregrina*, and several representatives of the Cycadaceae.

The root-nodules are as typical in general character for each kind of plant as their other points of differentiation—such as the shape of their leaves, or the arrangement of these on the stem. The spherical nodule is probably the most common form.—*C. H. L.*

Olive Propagation. By A. E. de Mazières, J. Chapelle, and J. Ruby (*Rev. Hort. d'Alg.* p. 107; April 1912).—Two articles on propagation of olives by seed, by cuttings, by layering, and by various forms of grafting and budding. Some practices peculiar to Spain and Tunis are described, and generally the particular conditions under which each method is most suitable are pointed out.—*M. L. H.*

Onion Seed and Sets, Home Production of. By W. R. Beattie (*U.S.A. Dep. Agr., Farmers' Bull.* 434; 1911).—Farmers generally are returning to the custom of growing their own onion seed, which is well, on the whole, as they can practise selection better than the commercial growers; and also, carefully grown seed planted in the same general locality will give better results than seed brought from a distance. This is especially true in northern localities, where the season of growth is short, as southern-grown seed requires a longer season for its maturity.

The crop must be kept clean, for, once infested by weeds, it is practically doomed. Rich sandy loam and land with lime in it are both suitable.

The vitality of the seed diminishes rapidly after the second year, but depends upon thorough ripening and good quality. A damp climate is very prejudicial. The average yield in onion-set raising is three hundred bushels to the acre, and profits are not large, as sets bring only fifty to sixty cents the bushel.—*C. H. L.*

Orange Thrips, The. By P. R. Jones and J. R. Horton (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 99, pt. i.; March 1911; 3 plates, 2 figs., 4 tables).—This Bulletin is a report of progress for the years 1909 and 1910. The orange thrips (*Euthrips citri*, Moulton) scars the fruit and curls the leaves of the orange. It has increased in numbers with the growth of the orange industry in California, and its control is one of the chief insect problems confronting the citrus growers of that country.

High-pressure spraying with a contact insecticide, such as black-leaf tobacco extract in distillate-oil emulsion, gives the best result up to now, three or four applications being necessary for complete control.
V. G. J.

Orchard Drainage a Necessity. By A. H. Carson (*U.S.A. St. Bd. Hort. Oregon Rep.*, 1909-10, p. 85).—Many soils would grow fruit orchards profitably were they properly drained at the outset. This is the case with shallow soils of two or three feet, having a hard subsoil beneath upon which in a wet season water accumulates, preventing healthy root-growth, and which are also the first to dry out in the hot weather.

By draining these four or five feet below the surface with earthen pipes (" tiles ") the depth of available soil is increased to that amount, and the necessary circulation of water and of air is ensured.

Drainage, again, is absolutely necessary where irrigation is practised, unless the subsoil is of a nature to carry off surplus water by itself. Disregard of this necessity has converted about 700,000 acres of land in the West into swamp.

The preliminary outlay is great (for draining must be accurately graded by an expert), but it is an investment for all time.—*C. H. L.*

Paper-Making, The Utilization of Crop Plants in. By Chas. J. Brand (*U.S. Dept. Agr. Year Book*, pp. 329-340; 1910).—There are numerous crops whose residues furnish material now going to waste that might be used for paper-making, such as corn-stalks, rice-straw, cotton-mill fibre, cotton stalks, bagasse (refuse of sugar-cane), flax-straw, &c. Besides these, there are plants that might be grown at a profit, solely for paper-making purposes, such as hemp, the well-known grass, *Eulalia japonica*, esparto (much used in Europe, and obtained from Algeria, Tripoli, Spain, &c.), okra, jute, and others. The paper produced from the above could hardly be cheap enough for

newspaper use, for which purpose ground wood-pulp is likely to be used for a long time to come; but the pressure on the available and irreplaceable supply of wood might be reduced by using the crops mentioned in making paper for magazines, books, paper-bags, and other commercial purposes.—*C. H. L.*

Park, National Swiss (*Rev. Hort. d'Alg.* p. 74; Feb. 1912).—A reservation has been formed in the Val Cluoza, in the Canton des Grisons, in the Lower Engadine, which is to be free for twenty-five years from the depredations of sportsmen, collectors, and amateur botanists. It is a region singularly rich in typical animal and vegetable life, and it is to be kept as a place where this life may be studied without fear of its extermination.—*M. L. H.*

Parnassia, Embryology of. By Lula Pace (*Bot. Gaz.* vol. liv. pp. 306-329; Oct. 1912; 4 plates).—This paper contains a full account of the ovule, embryo sac, synergids, endosperm-nucleus, chromosomes, general cytology, and fertilization of *Parnassia*, which is compared with *Saxifraga* and *Drosera*. The author considers that it is most nearly allied to the Droseraceae, and should be removed from Saxifragaceae to that order.—*G. F. S. E.*

Peach and Plum Slug, Notes on the. By R. A. Cushman (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 97, pt. v.; Nov. 1911; 1 plate, 3 figs., 8 tables).—The growing popularity of spraying peaches and plums with arseniate of lead in self-boiled sulphur-wash, for plum curculio and fungous diseases will undoubtedly reduce the damage done by the peach and plum slug (*Caliroa* [*Eriocampoides*] *amygdalina* Rohwer), which skeletonizes the leaves. It is mostly in small unsprayed home orchards that it will be found in injurious numbers.—*V. G. J.*

Peach Bud Mite, Notes on the. By A. L. Quaintance (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 97. pt. vi.; Feb. 1912; 5 plates).—For some years nurserymen in the East have complained of a trouble with peach nursery stock, resulting from injury to the tender terminal bud of the principal shoot, which injury causes the cessation of growth of the shoot and results in the development from the lateral buds of numerous branches, a condition not desired where a single vigorous shoot is wanted. It has been ascertained that the damage is caused by a mite identified as *Tarsonemus watei* Banks. Little definite information has been obtained up to now of its life-history, but it appears to hibernate behind the buds during winter, and commences its attacks early in May. There are probably three generations.—*V. G. J.*

Peach, Fungus Disease of. By H. H. Whetzel (*U.S.A. St. Fruit Growers' Ass., New York*; 1912).—The diseases known as leaf curl, brown rot, scab, mildew, crown gall, and canker are dealt with, and suitable methods of treatment recommended. The best spray is thought to be the lime-sulphur wash.—*F. J. C.*

Peaches, The Drying of, in Chile (*Rev. Hort. d'Alg.* p. 418; Dec. 1911).—An account of the widespread industry of peach-drying in the province of Coquimbo, in Chile. The peaches are peeled by hand, bleached by the action of sulphur fumes, and dried in the open air by the sun. The operations of peeling and subsequently removing the stones at a certain stage of the drying process require some skill, and give employment to many of the female inhabitants of the departments of Elqui and Ovalle, in the province of Coquimbo.—*M. L. H.*

Pear Blight. By A. H. Carson (*U.S.A. St. Bd. Hort., Oregon, Rep.* 1909-10, p. 34).—Impresses upon fruit-growers the absolute necessity of using the knife as the *only* remedy for this dangerous disease. Advertized sprays are no good. The great increase in spraying against insect pests and fungoid diseases is a striking testimony to the efforts of the Board in educational work. The fruit-growers should not confine themselves to one crop only, but should be self-supporting in the way of hay, feed, and other crops that are absolutely necessary on the farm, instead of buying them (p. 51). "Smudging" (p. 52) to prevent injury to the spring bloom from frost should be classed among the important operations of fruit-growing, just as spraying, pruning, &c. The "fourth district" could do with more people from the Eastern States, for they "could find plenty of room and work with insured prosperity."—*C. H. L.*

Pear, Hold-over Blight in. By W. G. Sackett (*U.S.A. Exp. Stn., Colorado, Bull.* 177; June 1911; figs.).—The question investigated was the extent to which the "fire blight" organism, *Bacillus amylovorus*, survives the winter in dry districts. It has been repeatedly stated that very few exist in spring, but the author finds this statement inaccurate, at least 20 per cent. of the cankers on the young branches and twigs containing active germs at flowering time.—*F. J. C.*

Pears, Stocks for (*Rev. Hort. d'Alg.* p. 82; March 1912).—It appears that the native pears make far the best stocks for grafted pears in Algeria. By their use the difficulties of growing pears in very chalky soil seem to be removed, and the scions so grafted make much larger specimens than any grafted on quince or French pear stocks. The native pears for stocks must be reproduced from seed. Runners taken from wild plants make stocks which continue to produce runners.
M. L. H.

Pear Thrips, How to Control the. By S. W. Foster and P. R. Jones (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 131; Jan. 1911; 15 figs., and tables).—This insect, on account of its small size and the rapidity with which it increases and spreads over large areas, is very difficult to control. The full-grown thrips are on the wing from the middle of February to early in April. They feed on the fruit buds of all deciduous fruit trees, eating away the soft and

tender parts. The eggs are deposited just under the epidermis of the fruit and leaf stems and young fruit; the larvæ, on emerging, feed on the young leaves and fruit from March till April, and pupate in the soil beneath the trees.

The thrips is common throughout California, and Bagnal (in the *Jour. Econ. Biol.* 4, 1909) reports the insect in England.

Experiments with soil fumigants, fertilizers, and irrigation have proved costly and futile. Ploughing and harrowing in the autumn, followed in early spring by thorough spraying with a tobacco extract containing $2\frac{3}{4}$ per cent. nicotine, diluted at the rate of one to sixty in a 6 per cent. distillate-oil emulsion, has been found the most satisfactory method of dealing with the pest.

The circular contains formulæ for the correct preparation of the spray recommended.

High-pressure spraying machines must be used, and the nozzle held close against the buds, directing the spray into the ends of them and not against the sides.—*V. G. J.*

Pear Thrips, The. By P. J. Parrot (*U.S.A. Exp. Stn. New York, Bull.* 343; Jan. 1912; 4 plates, 4 figs.).—The life-history of the Pear thrips is given, and methods of treatment advised. In spraying for this pest the author insists that two objects should be kept in mind: (1) To kill the winged thrips, and (2) to destroy the larvæ after petals drop to reduce the numbers of the insects that will mature in the ground.

A.	Nicotine extract 2·7 per cent. (Black leaf)	6 qt.
	Water	100 gall.
	Soap	2 to 5 lb.
	or,	
	Kerosene emulsion	3 gall.
B.	Nicotine extract 40 per cent. (Black leaf)	$\frac{1}{2}$ to $\frac{3}{4}$ pint
	Water	100 gall.
	Soap	2 to 5 lb.
	or,	
	Kerosene emulsion	3 gall.

Both these formulæ are recommended.—*V. G. J.*

Phosphate and Cumarin. By J. J. Skinner (*Bot. Gaz.* vol. liv. pp. 245-249; Sept. 1912).—Cumarin is found to be poisonous to seedlings of wheat. The leaves do not unfold or are distorted and curled. But by using either monosodium, disodium, or trisodium phosphate the injurious effect of the cumarin can be overcome.

G. F. S. E.

Phosphate Fields of Florida. By W. H. Woggaman (*U.S.A. Dep. Agr., Bur. Soils, Bull.* 76; Feb. 1911).—The Florida deposits are worked to an extent far outstripping all others in America and only

approached by those of Northern Africa. A large percentage of the best, and only the best, is exported to Europe. The life of the hard rock phosphate in Florida is variously estimated at from twenty-five to one hundred years, but the deposits of pebble phosphate are considered almost inexhaustible, these being the two most important classes. The former is sold on a guarantee of 77 per cent. of tricalcium phosphate, and the latter of 60 to 75 per cent. It is estimated that the actual amount of phosphoric acid lost in preparing the rock for the market is nearly twice as great as the quantity saved (p. 14), and it is imperative to devise means of conserving and handling what is now wasted, for the use of the home consumer. Experiments have been made in the direction of obtaining a cheap solvent to take out the phosphoric acid from the waste, but so far it has been found impossible to accomplish this without dissolving out considerable quantities of iron and alumina as well (p. 16).—*A. P.*

Phosphates of Tennessee, Kentucky, and Arkansas, Report on the Natural. By W. H. Woggaman (*U.S.A. Dep. Agr., Bur. Soils, Bull.* 81; March 1912; map and 4 plates).—The phosphate deposits of Tennessee rank next in importance to those of Florida. The industry in the other two States named is still in its very early stages of development. The Report describes the conditions prevailing in these fields, with modern methods of mining and handling the rock and disposing of the finished product and waste material.—*A. P.*

Plant Disease Survey in the Vicinity of San Antonio, Texas. By F. D. Heald and F. A. Wolf (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 226; 1912).—A record of a large number of fungus and bacterial diseases of cultivated and wild plants investigated during the years 1909 and 1910, illustrated by nineteen good plates.

The variety of roots attacked by *Cercospora* is remarkable.

D. M. C.

Plum Leaf-Miner, The. By C. R. Crosby (*U.S.A. Exp. Stn., Cornell, Bull.* 308; Dec. 1911; 14 figs.).—This bulletin treats of a new insect enemy of the plum (*Nepticula slingerlandella* Kearfott). In its injurious stage it is a smooth, greenish-white larva one-sixth of an inch in length, found during late June and early July feeding between the outer layers of the leaf, from three to twelve mines are often found in a single leaf. The trees become partially defoliated, and the fruit may fall prematurely. There is little doubt about it being a native American insect, and injury caused by it was first reported in 1907. It is a difficult pest to control, and measures directed against the moths, eggs, and larvæ have all failed, and only partial success has been attained by good cultivation to destroy the larvæ and pupæ in their cocoons.—*V. G. J.*

Poisonous Salts and Fertilizers. By Oswald Schreiner and J. J. Skinner (*Bot. Gaz.* vol. liv. pp. 31-48; July 1912; 5 figs.).—

The authors experimented with wheat seedlings and found that cumarin, vanillin, and quinone showed a toxic effect which was manifested by checking of growth, decreased green weight, and various pathological symptoms. Less nutritive material was removed from the solutions in which plants treated with these poisons were grown. It was found that phosphatic, nitrogenous, and potassic fertilizers were most efficient in counteracting the injurious influences of cumarin, vanillin, and quinone respectively.

Vanillin and dihydroxystearic acid are reducing poisons, and were antagonized by fertilizers which stimulate oxidation. Quinone, an oxidizing poison, is antagonized by those fertilizers which check oxidation.

Harmful substances occur in soils and may require special fertilizers to counteract them. The good done by fertilizers may not be simply by the addition of plant food but by influencing other factors in the soil.—*G. F. S. E.*

Polystichum angulare pulcherrimum. By F. W. Stansfield (*Fern Gaz.* i. pp. 274-280; March 1912).—An account of several forms belonging to the variety *pulcherrimum* and the difficulty experienced in growing them.—*F. J. C.*

Polystichums: Species and Varieties. By C. B. Green (*Fern Gaz.* i. pp. 227-231, 262-267; Dec. 1911, March 1912; figs.).—The British species, and especially their varieties, are briefly described, and notes on cultivation given.—*F. J. C.*

Potato Culture. By J. H. Shepperd and O. O. Churchill (*U.S. Agr. Exp. Stn., N. Dakota, Bull.* 90. Jan. 11; illustrated).—This pamphlet emphasizes the value of seed selection, and in addition recommends that potatos be grown intensively, for a poor yield of potatos never pays.

Much useful information is given as to culture, soils and their preparation, fertilizers, seed, selection, planting, harvesting, storage, &c., and under "Commercial uses" we are told that "In 1904-1905 Germany manufactured 76 million odd gallons of denatured alcohol from potatos, using for the purpose 95 million odd bushels. It required 1·26 bushels of potatos for every gallon of alcohol produced."

C. H. L.

Potato Leaves, A Bacterial Disease of. By Elizabeth Dale (*Ann. Bot.* xxiv. pp. 133-154; 1912).—A new bacterial disease of potatos is described in this paper. The organism differs both in its reactions and in its effects on the plant from *B. solanacearum* and *B. melanogenes.* It forms tubes similar to those found in Leguminosae and is named *B. tubifex.* The author shows that the bacillus attacks the leaves of the potato plant by piercing the cuticle where this is thin enough for it to penetrate. The bacilli form a kind of zoogloea and dissolve the middle lamella of the host plant by means

of a ferment, and pass between, or occasionally across, the cells of the host plant. Infection generally takes place near the edges of the leaves.

The disease is of little practical importance, and in a warm, dry summer would probably not show itself. A table is given showing the characteristics of different bacteria pathogenic to the potato.

A. D. C.

Potatos and other Crop Plants in Nevada, The Nematode Gall-Worm on. By C. S. Scofield (*U.S.A. Dep. Agr., Bur. Pl. Ind., Circ.* 91; Feb. 1912; 21 figs.).—The gall-worm occurs very generally in the Southern United States. In many places it is found in such large numbers as to be a serious pest to many plants, such as the peach, fig, cotton, cow-peas, and many vegetables. In seed potatos they are particularly dangerous, as the land planted with them will be infected with the worm. Infected potatos do not always show the same symptoms, but usually the skin is roughened and broken in patches and there is a ring of darkened tissue just under the skin, a microscopical examination of which will reveal the presence of the mature females and young larvæ. The presence of the worm causes swellings or galls on the roots of infested plants.

Probably the best means of combating the nematode is by planting crops which are known to be free from its attacks. Corn, wheat, rye, barley, and oats are among the plants not subject to its attentions. All nursery stock should be carefully inspected prior to planting, and potatos should not be used for seed if they come from an infected area. With regard to indoor crops, the soil used in greenhouses and frames can be sterilized.—*V. G. J.*

Potato Tubers, On the Cause of Blindness in. By Elizabeth Dale (*Ann. Bot.* xxiv. pp. 129-131; 1912).—The author describes a blindness of potato tubers caused by the fungus *Verticillium albo-atrum.* She summarizes her results as follows. The mycelium is present in the blind tubers, where it causes the destruction of most of the eyes. It grows up into the new shoots when any are formed, and in some cases it may pass into the sub-aerial shoots. In other cases it never goes beyond the subterranean stems, and creeps along them into the newly formed tubers, internally as a colourless mycelium in the cortical tissues, externally as a scanty, thin, brown mycelium. Thus the tubers may be infected by means of the vegetative mycelium only, without the formation of any kind of spore. The course of the fungus from the old to the new tuber may be traced by means of the brown coloration of the aerial tissues. Tubers have been grown in three successive years from the original diseased crop, and in each year some have been blind.—*A. D. C.*

Potato, Variations of the (*Rev. Hort. d'Alg.* p. 422; Dec. 1912).—As the result of experiments and investigations, the writer asserts that as far as the wild races of *Solanum* are concerned (*S. Commersonii*, *Maglia*, *utile*, *verrucosum*, *edinense*) their essential

characters have been maintained both after root multiplication and in reproduction by seed, as far as this last has been able to be carried out. Further, he declares that among the numerous varieties of the cultivated potato no variation affects any specific character, and no seedling has ever shown any absolute new character. What are produced are merely new combinations of characters already known among older varieties, and the variations are due to the hybrid character of the parent, and not to mutation. No cultivated variety of potato will breed true by seed and is only reproduced by division.

He concludes, therefore, contrary to the opinion of some writers, that it is not by any means proved that *S. Commersonii* or *S. Maglia* has ever passed into the cultivated potato, or that these three—*S. Commersonii*, *S. Maglia*, and *S. tuberosum*—have ever converged into similar forms. It would be well to follow up successive generations of *S. tuberosum* from seed, so as to arrive at a pure strain of fixed character, both to throw light on the pedigree of the cultivated potato and perhaps to give new life to strains which may have degenerated by too prolonged and asexual multiplication.—*M. L. H.*

Powder Post Beetles of the Family Lyctidae of U.S.A. and Europe, A Revision of the. By E. J. Kraus (*U.S.A. Dep. Agr., Bur. Entom., Bull. Tech.* ser. xx. pt. iii.; May 1911).—The family Lyctidæ is represented in North America by certain species of special economic importance as causing injury to seasoned wood products known as "powder post." These species have been the subject of extensive investigations by the writer and his associates to determine their habits, history, and methods of control. There is an appendix by A. D. Hopkins with a list of described species.—*V. G. J.*

Primula obconica, The History of, under Cultivation. By A. W. Hill (*Jour. Gen.* ii. p. 1; Feb. 1912; plates).—The history of *Primula obconica* since it was introduced in 1879 by Maries up to the present time, tracing the various forms it has assumed under cultivation and comparing them with the wild type. The evidence points to the fact that all the varieties now in cultivation have been derived through careful selection. No attempts at hybridizing have apparently been successful, although several have been made.—*F. J. C.*

Races, Geographical, with Partly Fixed and Partly Variable Characters. By Viviand-Morel (*Rev. Hort. d'Alg.* p. 412; Dec. 1911).—The first of a series of articles on the well-marked variations which appear among the species of plants which are indigenous over a widespread area. These variations appear as the distinguishing peculiarities of "geographical races," such variations being evidently produced by environment and not the result of hybridization. Some typical examples of such geographical races have been collected and transplanted, and during the time they have been under observation so far the variations have persisted under cultivation. They also reappear in succeeding generations of annuals, but opinions

differ as to whether they will really be found to do so in the case of perennials. The writer of this article quotes passages from the writings of A. Jordan to show that this careful investigator was perhaps too much inclined to doubt the correctness of facts which interfered with his preconceived theories, and he considers that in studying these geographical races it is possible to rely to a certain extent on both Darwinism and Jordanism in order to find an explanation for the fixity of some of their biological and the variability of some of their morphological characters.—*M. L. H.*

Ranunculaceae, Flower in. By Dr. S. Trapl (*Beih. Bot. Cent.* Bd. 28, pp. 247-281; 16 figs.).—The author describes and figures a large number of transitional perigon parts, nectary-stamens, &c., in a large number of genera of this order. He finds an extraordinary variability in the flower diagram. Even *Ranunculus acris* is sometimes acyclic.

He considers that the original type is *Calycanthus*, which is entirely acyclic from the bracts to the carpels. This has changed into hemicyclic and encyclic types, and along with this has gone a parallel alteration from polycycly and polymery to oligocycly and oligomery.

Thus in *Anemone blanda* and *Adonis vernalis* there are two whorls of eight petals.

In *Aquilegia* there is a constant number of five parts in the whorl, but there are several whorls of stamens.

In some Brazilian Ranunculi there are only a few extra carpels, which prevent the flower being a pentamerous encyclic one.

The succession is as follows: Polymerous acycly, polymerous hemicycly, oligomerous hemicycly, oligomerous polycycly, and, finally, oligomerous oligocycly, tending to a flower with five sepals, five petals, five stamens, and five carpels, with members in the whorls alternating.

Along with this goes a differentiation of sepals and petals. In true Ranunculaceae, the latter are either petaloid or nectarial, whilst in Anemoneae and Clematids there is not any differentiation.

Thus the order belongs to a stage of evolution which other orders have passed through.

Several interesting sports are figured.—*G. F. S. E.*

Rhizoctonia, The Morphology and Parasitism of. By F. J. F. Shaw (*Mem. Dep. Agr.*, India, iv. No. 6, Sept. 1912; figs.).—Species of *Rhizoctonia* attack a large number of different hosts, and often cause considerable loss. Several forms are studied and their cultural and morphological peculiarities noted. He considers the form on potato, for which he selects the name *Rhizoctonia solani*, identical with that attacking jute, cotton, ground nut, and cow pea. He considers the form of *Rhizoctonia*, identified by Rolfs (see JOURNAL R.H.S. 27, p. 1182, etc.) with *Corticium vagum* as its spore-bearing stage, to be different from the foregoing *R. solani*.—*F. J. C.*

Root-Knot and its Control. By Ernst A. Bessey (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 217; 1911).—The writer describes the life-history of the nematode *Heterodera radicicola* which causes root-knot in a very large number of different plants. Lists of the susceptible and immune plants are given, the former largely outnumbering the latter.

Heterodera radicicola is distinct from *Tylenchus tritici*, *T. dipsacii*, &c. Its larva is susceptible to adverse conditions and cannot stand desiccation like the other nematodes mentioned. Also it cannot remain alive very long in water. A large number of experiments for the control of root-knot are recorded.

The soil was treated with various chemicals and artificial manures none of which proved effective except on a small scale, some on the ground of expense, others on the ground of ineffectiveness. The rotation of immune crops for several years on infected land proved to be the most successful means of controlling this pest. Many of the common weeds are highly susceptible and must be kept down rigorously and the crop sown so thickly as to effectually choke out the weeds. The nematode travels slowly through the soil, but can be widely distributed by nursery stock, cultural implements, &c., and by torrential rains which wash infected soil on to lower non-infected land.

Some of the resistant plants belong to the Leguminiosae, such as Cowpea (iron variety) and hence if grown enrich the soil besides keeping down *Heterodera radicicola*. The author points out the necessity of raising immune varieties of the susceptible plants.

Probably the most satisfactory method of destroying the root-knot in greenhouses and seed-beds is the use of live steam under considerable pressure.

The length of time varies according to the pressure of steam, depth of bed, &c., but a sure test as to whether the steam has passed long enough is to bury potatos in the soil, and when they are thoroughly cooked the steam can be safely turned off.

Special boilers at fairly high pressure are to be recommended, with the pipes attached to them running through the soil. A formalin drench of one part commercial formalin (40 per cent.) in 100 parts water is effectual, applied at the rate of 1-1½ gallons (rather more in the case of absorbent soils) to the square yard.

An interval of ten days should elapse before planting. Good plates and an extensive bibliography are given.—*D. M. C.*

Rose, A New Climbing (*Rev. Hort. Belge*, p. 241; Aug. 1, 1911; coloured plate).—The new Wichuraiana rose 'Aviateur Blériot' is said to be a valuable new climbing variety introduced by M. A. Braechman, of Wetteren. In colour it is saffron-yellow with a golden-yellow centre.—*M. L. H.*

Rose 'Wichmoss.' By R. Barbier (*Rev. Hort. Belge*, p. 317; Oct. 1, 1911).—A hybrid rose of which the origin is Wichuraiana ×

moss 'Salet' is here described. It is said to be vigorous, a free flowerer, hardier than most Wichuraianas, and highly ornamental. The branches are covered with small spines as in its moss parent, which for a pole rose which is liable to be planted where it will throw its current year's growth over paths or grass plots is perhaps scarcely a recommendation.—*M. L. H.*

Roses, Black Spot of. By F. A. Wolf (*Bot. Gaz.* vol. liv. pp. 218-234; Sept. 1912; 1 plate).—The author describes the black spot leaf disease of roses due to *Actinonema rosae* (Lib.) Fries.

The fungus threads penetrate the mesophyll of the leaf and are connected by hyphæ which pass through or between the epidermal cells to the branched, radiating, anastomozing mycelium, which is formed above the epidermis but below the cuticle of the leaf. Conidia are formed from the latter and in great numbers. The cuticle eventually bursts, and the conidia are set free. They germinate readily and can be grown on bean pods.

Rose leaves kept out of doors in winter in wire cages had formed shield-shaped structures in April. These were found to be the perithecia of the fungus. The asci and paraphyses are formed from tissue which is sub-epidermal, whilst a shield formed of radiating dark brown strands of mycelium, and which is of separate origin, stretches over the top of it above the epidermis but below the cuticle. The author traced the development of ascospores which eventually pile up in a whitish heap in the open perithecium. With these ascospores the author was able to infect rose leaves producing the usual *Actinonema rosae*. The fungus is described as *Diplocarpon rosae*, n. g. and n. sp.

At Pavia only four varieties of the 600 roses grown were apparently free from the fungus. It can, however, be controlled by any of the standard copper compounds.

Moreover, as it winters in dead leaves, infection can be prevented by collecting and burning all rose leaves in autumn or spring.

G. F. S. E.

Roses, Forcing. By A. Buyssens (*Rev. Hort. Belge*, p. 277; Sept. 1, 1911; plate).—Great quantities of roses are forced in the neighbourhood of Brussels for the Paris, London, Berlin, and other markets. The object of the growers is to produce large, erect roses on long stems which shall be ready to cut through the winter and until the first open-air roses are available. The varieties forced are 'Caroline Testout,' 'Ulrich Brunner,' 'Captain Christy,' 'Mrs. John Lang,' 'Frau Karl Druschki,' 'Mme. Gabrielle Luizet,' and 'Kaiserin Augusta Victoria,' and this article gives an exact description of the cultural methods employed.—*M. L. H.*

Sap, Ascent of. By A. Ursprung (*Beih. Bot. Cent.* Bd. 28, pp. 311-322).—The author describes a number of experiments made by himself and others which go to show that living cells of the stem are

essential to the transpiration current, and examines critically the views of Dixon, Overton, and others, showing how their experiments can be explained according to the above theory.—*G. F. S. E.*

Saprophytes of Java, Contributions to our Knowledge of. By A. Ernst and C. Bernard (*Ann. Jard. Bot. Buit.* ser. ii. vol. ix. pt. ii.; 1911).

VII. A Systematic Description of *Burmannia candida* and *B. Championii*. By J. J. Smith. Pp. 79-83; with 2 plates.

This paper contains a detailed account of the most important morphological characters of these two species of *Burmannia*.

B. candida is widely distributed in the Indo-Malayan region, while *B. Championii* has hitherto only been reported from Ceylon. It has now been found in Java as well.

VIII. The External and Internal Morphology of *Burmannia candida* and *B. Championii*. By A. Ernst and C. Bernard. Pp. 84-97; with two plates.

The roots of *B. candida* are swollen and fleshy, while those of *B. Championii*, which spring from a fleshy rhizome, are thin. The roots of both species are exceptionally well furnished with fungal inhabitants (mycorrhiza). The epidermal cells are usually alone free from fungi in *B. candida*. Nearly all the cells of the outer cortex, and many of those of the inner region of the cortex contain fungi in this species. In *B. Championii* the large epidermal cells and the middle layers of the cortex are especially rich in fungi.

The leaves of both species are scale-like and lie close against the stem. The epidermal cells of the leaf are elongated in the direction of the long axis of the leaf. In *B. Championii* the epidermal cells are all alike, but in *B. candida* pairs of cells occur, between the elongated cells, which resemble stomata. These "stomata" are permanently open, and, as the leaves contain no chlorophyll, they cannot carry on the normal functions of stomata. They may possibly function as water-pores, but this is unlikely, and they most probably are functionless remnants of stomata which are in process of degeneration in consequence of the saprophytic habits adopted by the plants. It may be recalled in this relation that Pirotta and Longo have also recorded the existence of a modified stomatal apparatus in the chlorophyll-free parasite *Cynomorium coccineum*. All saprophytes previously examined, however, have been found to be entirely without any traces of stomatal organs, with the single exception of the holosaprophyte *Epipogon aphyllum*, on the rhizomes of which stomata occur.—*R. B.*

Saprophytes of Java, Contributions to the Knowledge of. By A. Ernst and C. Bernard. IX. Development of the Embryo-sac and Embryo of *Burmannia candida* and *B. Championii* (*Ann. Jard. Bot. Buit.* ser. ii. vol. x. pt. ii. pp. 161-188; 1912; 5 plates).—The somatic number of chromosomes is twelve, and the reduced number six. In *B. candida* the embryo-sac mother-cell divides once into two

cells. Of these the lower becomes the embryo-sac without further division, whilst the upper cell degenerates. In *B. Championii* the tetrad-divisions are more complete, and the mother-cell usually divides into either three or four cells. The lowest of these cells becomes the embryo-sac. The Burmanniaceae which have, up to the present, been examined show a complete series of stages in the reduction of the tetrad-division. In *Gymnosiphon trinitatis* there appears to be (according to the researches of Johow) a perfectly normal heterotype and homotype division, with a reduction in the number of chromosomes and the production of four cells. In *Thismia javanica* four cells are also produced, but there is no reduction in the number of chromosomes. In *Burmannia Championii* four, three, and sometimes only two, cells are produced from the embryo-sac mother-cells. In *Burmannia candida* the production of only two cells from the mother-cell is the rule, while in *B. coelestis* the mother-cell undergoes no division at all, but at once becomes the embryo-sac. The development of the embryo-sac cell into the usual eight-nucleated embryo-sac, with egg-apparatus, antipodal cells, and free polar nuclei, takes place in the usual manner in both *B. candida* and *B. Championii.*

The question of the mode of fertilization of the Burmanniaceae has been said to be uncertain by several recent writers (*e.g.* Engler). But as long ago as 1840 Miers showed that certain Brazilian Burmanniaceae are self-fertilized. This was confirmed by Warming in 1901, and now once again the present authors find that both *B. candida* and *B. Championii* are self-fertilized. The pollen-grains usually germinate in the anther of the stamen, and the pollen-tubes grow out along the connectine to the stigma of the flower.

After fertilization an interesting feature in the development of the endosperm consists in the production of a "basal" or "haustorial" cell, as the result of the first division of the secondary nucleus of the embryo-sac. This early production of a "basal" cell, which undergoes no further divisions, is characteristic of all the species of *Burmannia* which have so far been examined. At a later stage the "basal" cell develops a series of cellulose bars, which stretch across the cell cavity. The very light and winged seeds of these two species of *Burmannia* are most probably wind-dispersed.—*R. B.*

Saw-flies and Wood-Wasps of the Family Tenthredinoidea, The. By S. A. Rohwer (*U.S.A. Dep. Agr., Bur. Entom., Tech.* ser. xx. pt. ii.; March 1911).—The paper deals with the saw-flies and horntails, and comprises the families Tenthredinoidea and Siricoidea of Ashmead's classification.—*V. G. J.*

Saw-fly Genus Hoplocampa, Studies in the. By S. A. Rohwer (*U.S.A. Dep. Agr., Bur. Entom., Bull. Tech.* ser. xx. pt. iv.; May 1911; 4 plates, map).—This paper gives the result of studies of the entire group representing species and genera which are of special economic importance.—*V. G. J.*

Sequoia sempervirens in Algeria. By Dr. Trabut (*Rev. Hort. d'Alg.* p. 78; March 1912).—About fifty years ago M. de Lannoy, Resident Engineer, did some experimental planting at Djebel Onach, and as a result the colony now possesses some fine specimens of *Sequoia sempervirens*. It seems, therefore, that this tree might well be employed in the re-afforestation of this part of Algeria.—*M. L. H.*

Silver-Leaf (Der Milchglanz der Obstbäume). By H. T. Güssow (*Zeitschr. f. Pflanzenkr.* xxii. p. 385; 1912; figs.).—A description of the too well-known silver-leaf disease which attacks most of our fruit trees and many forest trees and is now also recorded from Canada. He ascribes the disease to the fungus *Stereum purpureum*, and gives an account of the experiments which have proved this fungus to be the cause. The figures show the lesions produced in the affected plants and the fungus mycelium in the wood, and its fruits.—*F. J. C.*

Soil, Fungous Flora of. By C. N. Jensen (*U.S.A. Exp. Stn., Cornell, Bull.* 315; June 1912; many figures).—A discussion of the fungi occurring in the soil, with descriptions of the species found by various workers, and notes upon their relation to diseases, &c.

F. J. C.

Soils of the Prairie Regions of Alabama and Mississippi, and their Use for Alfalfa. By H. H. Bennett and M. A. Crosby (*U.S.A. Dep. Agr., Bur. Soils and Pl. Ind., Rep.* 96; Dec. 1911; 6 plates, 4 figs.).—In these regions there are extensive areas of a dark-coloured upland calcareous clay soil, known as Houston clay, which is particularly well adapted to the cultivation of alfalfa. The natural productiveness of the soil is shown by the fact that much of this land after seventy-five years or more of practically continuous cultivation to cotton and corn without the addition of any kind of fertilizer still produces three-fourths of a bale of cotton to the acre (p. 14). The haying season for alfalfa extends from April to November, and during that time four to six crops are harvested. It is recommended not to use the flowering period as a guide to the proper time for cutting, but to choose the time when the new shoots are just starting from the base of the plants (p. 43).—*A. P.*

Sprays and Spraying. By Prof. A. B. Cordley (*U.S.A. St. Bd. Hort. Oregon Rep.* 1909-10; p. 63).—Spraying is absolutely essential for the good management of fruit-orchards, but it is not necessary to multiply the varieties of sprays used. Three are quite sufficient, possibly one too many—viz. arseniate of lead, Bordeaux mixture, lime-sulphur.—*C. H. L.*

Stipular-structures, Morphological and Phylogenetic udies of. By Prof. Dr. K. Domin (*Ann. Jard. Bot. Buit.* ser. ii. vol. ix. pt. ii. pp. 117-326; 1911; 11 plates).—This is a comprehensive discussion of the morphology and phylogeny of stipular-structures

in Cryptogams, Gymnosperms, and Monocotyledons. Stipular-structures are leaf-like expansions which arise from the leaf base. They may occur either in the form of a sheath or as lateral appendages (stipules) of the leaf base. The author regards the sheath as the original form of stipular-structure, and considers that the paired stipules are derived from the sheath by the abortion of the sheathing part and the survival of the wing-like side-lobes of the former sheath.

The petiole of the leaf is also regarded as a secondary structure which can be derived either from the sheath or from the blade (lamina) of the leaf.

Among the vascular Cryptogams the sheath is the only form of stipular-structure to be found, although in the Marattiaceae the lateral appendages of the sheath closely simulate a pair of stipules. Among the Gymnospermae, *Gnetum*, *Gingko*, and the Cycads possess stipular-structures in the form of sheaths. Among the Monocotyledons the sheath is the prevalent and original form of stipular-organ. In a few cases the sheath itself is so reduced and modified that the resemblance of the structure to a pair of stipules is very strongly suggested (*e.g.*, *Potamogeton* species, *Najas*, *Smilax otigera*).

In *Tamus* hair-structures (trichomes) simulate free stipules.

Among the Dicotyledons the author also believes that the majority of the free lateral stipules are only the side-appendages of an aborted sheath. In a few case, however, they may possibly have a direct origin independent of a sheath, but such cases will, beyond doubt, be found to be very rare.

Domin points out that, according to these views, a leaf with an aborted sheath, and with side-appendages alone surviving, indicates a higher state of morphological differentiation than one in which the stipular-organ is represented by a sheath. Since the latter condition is characteristic of the Monocotyledons, and the former is more common among the Dicotyledons, it follows that the Monocotyledons possess a more primitive form of leaf than the other great division of flowering plants, and this fact may be of significance in discussing the relative antiquity of the two groups of plants.

It is impossible in this abstract to indicate the wealth of details which is contained in Domin's paper. For these the original must be consulted.—*R. B.*

Stocks, Doubleness in. By Miss E. R. Saunders (*Jour. Gen.* i. pp. 303-376).—In this long paper Miss Saunders gives an account of the extensive series of experiments she has carried out in attempting to unravel the mystery of doubling in flowers; and, although the phenomenon is by no means solved, one or two facts have been brought to light that should be of great importance to the plant breeder. She finds that all sap-coloured races of ten-week stocks so far investigated—azure, light purple, dark purple, marine blue, flesh, copper, red, and two non-sap colours, white and cream—have two forms, an ever-sporting one which continually throws doubles in greater proportion

than singles, and a true breeding one that throws singles only. The sulphur-white breeds untrue to both singleness and colour, always throwing single whites, double creams, and a small proportion of double whites. It is further shown that on the whole the seeds which are destined to yield double-flowered plants are longer-lived than those destined to yield singles, but that there is no visual means of distinguishing the two forms, nor do seeds from different parts of the plant or from different parts of the pods give markedly different results.—*F. J. C.*

Stone Fruits in Oregon. By R. H. Weber (*U.S.A. St. Bd. Hort. Oregon Rep.* p. 93; 1909-10).—Besides apples and pears, stone fruits are largely grown in Oregon; in fact, this State holds pride of place in supplying the world with fresh and evaporated Italian prunes.

Next in importance come peaches. The long season of ripening enables the grower to harvest his own crop without extra help. The annual production of peaches amounts to millions of boxes.

Apricots were not equal in quantity to the demand, but this will soon be remedied.

Cherries are in great demand, can only be grown in certain districts, and are very prolific.

Comparing the culture of stone fruits with the apple and pear, there are three directions in which they are cheaper to grow:—

(1) They ripen early in the season, and therefore require less cultivation.

(2) With few exceptions, they do not require thinning.

(3) No summer spraying is necessary, as the codling moth does not attack them.—*C. H. L.*

Succulent Plants, Transpiration in. By E. Marion Delf (*Ann. Bot.* xxvi. p. 409-441; April 1912).—The subject is dealt with firstly in relation to the structure of the plant, and secondly in relation to habitat. In the first place the transpiring surface, the water-storing system, and the conducting system are distinguished and dealt with in detail. In the second, different types of plants are selected and discussed—namely, desert plants, epiphytes, halophytes, and alpines. A full summary of results is given, and in conclusion the author states that " many of the peculiarities of succulent plants must be regarded as adaptations to environment of real importance to the plant. They may be produced during the lifetime of the individual . . . or they may appear as permanent characteristics. . . . In all cases, however, the presence of aqueous tissue and the power of water-storage are probably of the first importance in the economy of the individual, and enable it to support a rate of water-loss which is very considerable, relative to the transpiring surface."—*A. D. C.*

Sugar Cane, Damage to, in Louisiana, by the Sugar Cane Borer. By T. C. Barber (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 139; June 1911; 7 tables).—The sugar-cane borer (*Diatraea saccharalis*

Fab.) is the most serious sugar-cane pest that the planter in Louisiana has to contend with.

It destroys the eyes of seed-cane, thereby reducing the stand during the following year; stunts the growth of the canes; and by tunnelling and girdling them makes them an easy prey to high winds. Also, the holes made by the borer are the means of entry for the various fungous diseases to which sugar-canes are addicted.

Investigations of methods of control are now being made, the results of which will be published in due time.—*V. G. J.*

Sugar Cane Insects of Hawaii, The. By D. L. Van Dine (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 93; June 1911; 4 plates, 4 figs.).—Among the sugar-cane insects discussed in this Bulletin are: (1) The sugar-cane leaf-hopper (*Perkinsiella saccharicida*); (2) the sugar-cane leaf-roller (*Omiodes accepta*); and (3) the sugar-cane mealy-bug (*Pseudococcus calceolariae*). Their life-histories and the best means of extermination are described in detail.—*V. G. J.*

Sugar Cane, Selection and Hybridization of the. By Lewton-Brain (*West Indian Bull.* vol. iv. p. 63; see vol. xi. No. 4, p. 338).—An account of most interesting experiments conducted along the lines of Mendel's laws, with the object of improving the tonnage of cane to the acre, the sugar-content of the juice, and the power of resistance to disease.—*C. H. L.*

Symbiosis and Parasites, Chemistry of. By Dr. Julius Zellner (*Beih. Bot. Cent.* Bd. 28, pp. 473-486).—The author gives a short sketch of the most recent discoveries in the theory of symbiosis. He then compares the chemical contents (fats, carbohydrates, cell-wall, proteins, ferments, bases, acids, colouring matters, ash) of host and guest, or of the two partners in symbiosis. Thus he gives these contents for algae, fungi, and lichens, for rye and ergot, for maize and *Ustilago Maydis*, for *Trametes* and willow, *Viscum* and its hosts, &c.

He lays stress on the great differences which occur between the cell-contents of the two forms. He finds that in lichens colouring matters occur for which it is difficult to find the chemical origin in either alga or fungus. Very few substances seem to pass without change from the host into the guest plant. The enzymes found in the parasite or saprophyte depend upon the chemical constitution of the host. The ash of the mistletoe differs from that of the wood and bark on which it grows, and bears more resemblance to that of the leaves of the particular tree. There are other interesting points in the paper regarding parasitism, phagocytosis, &c.—*G. F. S. E.*

Tannin Contents and Starch in Trees. By August Renvall (*Beih. Bot. Cent.* Bd. 28, pp. 282-306).—The author has examined the contents in tannin material (reaction to bichromate of potash) in buds, bark, wood, pith, &c., of twenty-two trees and shrubs (*Acer* spp., horse-chestnut, lime, birch, beech, *Syringa*, &c.), both in

winter and in spring. At the same time he examined the tissues microscopically for starch. He finds that whatever reacts to potassium bichromate examined in the cases cannot be ascribed to transformed products of starch, or only to a very limited extent. Nor can these tannin materials be due to the factors which influence starch transformation.—*G. F. S. E.*

Teratology, Studies in Tropical. By J. C. Costerus and J. J. Smith (*Ann. Jard. Bot. Buit.* ser. ii. vol. ix. pt. ii. pp. 98-116; 1911; 5 plates).—The present paper gives a record and description of the teratological deviations collected by Dr. J. J. Smith at Buitenzorg, or which had been sent him by residents in the East Indies. Some deviations in the pine-apple (*Ananas sativus*) are described. A branched pine-apple with no less than ten crowns springing from the one fruit is figured. *Cocos nucifera*, in which the normal pairs of male flowers upon the inflorescence had been replaced by single female flowers; abnormalities in *Alpinia Schumanniana*, in which the single stamen is replaced by two, and the petal is also doubled; deviations from the normal structure of several orchids (*Calanthe triplicata*, *Dendrobium cymbidioides*, *Vanda Hookeriana*, *Phalaenopsis amabilis*, *Saccolabium micranthum*, *Brassia sp.*) are described.

A three-carpelled fruit of *Myristica fragrans* is noted. The development of a small pitcher from the terminal leaflet of the trifoliate leaf of *Aegle Marmelos* is described.

A seed of *Mangifera indica* which had germinated in the fruit had produced in addition to the ordinary plumule and radicle a second root, also ascending and then curving sharply back like the radicle. This root is not in any connexion with the axis, but arises from one of the cotyledons.

A fruit of *Nephelium lappaceum* with two seeds is noted.

A case of synanthy in *Hibiscus Rosa-sinensis* is mentioned.

Other instances of teratological deviations are described in *Tectona grandis*, *Justicia procumbens*, and *Gaillardia picta*. In the last-named plant the flower-head possessed foliaceous bracts from a number of which branches had grown out. Some of these produced a secondary flower-head as well as leaves. This recalls the well-known case of hen and chickens in *Bellis perennis*, &c.—*R. B.*

Thielavia basicola on Ginseng, Infection Experiments. By J. Rosenbaum (*Phytopathology*, ii. pp. 191-196; figs.).—Cultures from various sources of the fungus *Thielavia basicola* proved to be identical in their morphology and infective capacity. Infection experiments were carried out on seedlings of ginseng which showed the fungus to be a true parasite on that plant. It proved to be capable of attacking both the aerial and subterranean parts of the plant and of infecting the young roots without previous injury, though the older ones were infected only after injury.—*F. J. C.*

Tidal Marshes and their Reclamation. By G. M. Warren (*U.S.A. Dep. Agr., Off. Exp. Stn., Bull.* 240; Oct. 1911; 16 plates,

21 figs.).—Numerous marsh lands have been surveyed and reported upon, both as to the efficiency of the drainage works and the financial results of cultivating the reclaimed land. The Bay of Fundy marshes are among the most remarkable, one boring showing a depth of marsh mud 80 feet thick overlying a 29-foot stratum of peat (p. 88), the soil being of such fine texture that very little grit can be detected by the fingers. All are agreed that these marshes have been built up by the violent tides for which this bay is so famous, and not from material brought down by the rivers. The amount of mud carried by the tides, due to erosion by the strong current, is almost incredible, and old lake bottoms have been filled up to the extent of 1 foot in five or six days.

The design and construction of drainage works and the principles of reclamation are discussed at length, not only in general but with reference to each of the marsh lands reported upon, while the crops raised and the financial results are also set out.—*A. P.*

Thysanoptera, North American. By D. Moulton (*U.S.A. Dep. Agr., Bur. Entom., Tech.* ser. xxi.; June 1911; 6 plates).—This is a synopsis, catalogue, and bibliography, with descriptions of new species.—*V. M. J.*

Thysanoptera, Some New California and Georgia. By Paul R. Jones (*U.S.A. Dep. Agr., Bur. Entom., Tech. ser.* xxiii. pt. i.; Jan. 1912; 7 plates.).—In connexion with investigations of the pear thrips and orange thrips in California it has been desirable to obtain as much information as possible on the characteristics, life-histories, and food habits of related species of Thysanoptera. Numerous species have been collected, many new to science, and in this paper the author describes several which have not before been recognized.—*V. G. J.*

Tidikelt, Crops in. By H. Laperrine (*Rev. Hort. d'Alg.* p. 37; Feb. 1912).—Experiments in acclimatizing various European vegetables and cereals in the district of Tidikelt in Algeria by successive French officials have been almost uniformly successful, but have not led to such useful results as they should have done for two reasons. No records have been kept at the various experimental stations, so that each experimenter starts no better equipped with local information than his predecessor, and very little progress has been made in teaching the natives to use European vegetables, through a misunderstanding of what is really to be aimed at. The natives are naturally distrustful of any strange food, so for their benefit it is well to work at producing improved varieties of vegetables they already know and at perfecting methods of cultivating them, and to trust to time and the tendency to imitation to develop a taste among them for the superior imported species. At the first symptom of a wish on their part, officers should, of course, be ready to respond lavishly with gifts of seed and hints on culture. Outside the oases the cultivator's difficulties are, of course, serious, and proceed from the want of water, the want of manure, and an excess of salt in the soil. The writer discusses

the want of manure at some length. The cost of carriage makes the use of artificial manures impracticable, and there is not enough feed to support more than a relatively small head of farm stock. Recourse must, therefore, be had to green manure, ashes, and the powdered crust of sun-burnt earth which is to be found in the neighbourhood of some of the oases. The writer considers that the solution of the problem lies in the adoption of the best succession of crops and of the crop most suitable for green manure, and in the introduction of some crop suitable for fodder which may be grown outside the limits of existing oases. Nothing is to be gained by breaking up more land than can be quite thoroughly irrigated, and as at present evaporation is the only way in which the salt-charged irrigation water is afterwards got rid of there might be danger to existing gardens in diminishing beyond a certain point the available surface for evaporation.

Col. Laperrine minutely describes native methods of farming, and adds notes on the behaviour of most of the principal European vegetables in his district.—*M. L. H.*

Timber, Insect Damage to Standing, in the National Park. By A. D. Hopkins (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 143; Jan. 1912).—Dead timber, both standing and fallen, is very commonly attributed to fire and storms; but, as a matter of fact, investigation shows it to be in most cases due to insect attacks. The Conifers, which are the predominating trees in the Western States, are subject to a high death-rate. The Pines, Spruces, Cedars, Firs, and Sequoias have each at least one destructive enemy, usually a beetle!

It is obvious, therefore, that a more wide-spread knowledge of the life-histories of the various forest insect pests, put to practical use, will do much to control and prevent depredation by them.—*V. G. J.*

Timber Rot caused by Lenzites sepiaria. By Perley Spaulding (*U.S.A. Dep. Agr., Bur. Pl. Ind., Bull.* 214; 1911).—The damage inflicted on timber in America by *Lenzites sepiaria* is enormous. It is often accompanied by other wood-rotting fungi. The length of service of railway sleepers, telegraph posts, etc., if untreated is diminished about one half.

L. sepiaria chiefly attacks conifer wood although it has been reported on the timber of some deciduous trees.

This fungus is rarely found on living trees but can undoubtedly penetrate felled wood when cut across the grain, or can gain access to the deeper-seated tissues by means of seasonal cracks.

The mycelium lives chiefly in the sap-wood, the heart-wood is rarely attacked.

The sporophores are rather small for a wood-rotting fungus. They rarely project more than 2 inches. They are long narrow shelf-like formations, frequently compound and closely clustered together.

The gill are branching and rather irregular. Pores are occasionally formed. The colour of the sporophores varies according to age, from

white to yellow, brown, and finally black in very old specimens. The sporophores are frequently edged with yellow or white.

In external appearance in the early stages the affected timber shows blackened, water-soaked, irregular areas. The decayed wood is brown, irregularly fissured into tiny cubical masses which crumble into dust between the fingers.

The fungus dissolves the middle lamella of the cell walls. The decay caused by *L. sepiaria* may be prevented or greatly retarded,

(i) By seasoning.

(ii) By floating the timber.

(iii) By chemical treatment.

Figures and Bibliography.—*D. M. C.*

Timbers, Microscopic Description of Tropical. By A. D. Hopkinson and F. W. Neger (*Beih. Bot. Cent.* Bd. 29, 441-456; 24 figs.).—The wood specimens described were obtained in the Cameroons, and include *Coula*, *Alstonia*, *Sterculia*, *Rhizophora*, *Terminalia*, &c.—*G. F. S. E.*

Tobacco Culture in Wisconsin. By J. Johnson (*U.S.A. Exp. Stn., Wisconsin, Bull.* 206; April 11; illustrated).—Tobacco culture has been in practice in Wisconsin for the last fifty-seven years. The best soils for the purpose are sandy loams. A good rotation is three years tobacco, then barley, and cloves each one year.

Good seed should be used and care exercised in the early stages and in planting out. Bruising the leaf should be avoided in harvesting, and for curing a properly built shed is essential, with expert knowledge on the part of the operator.—*C. H. L.*

Tomato Black Spot Fungi. By F. T. Brooks and S. R. Price (*New Phytologist*, vol. xii. No. 1; Jan. 1913; 13 figs.).—The writers received for examination some diseased tomatos grown out of doors near Bristol, and on the diseased portions of the fruits three fungi were found—a species of *Cladosporium*, a species of *Macrosporium*, and a fungus having pycnidial fructifications. The last-mentioned fungus proved to be the actual cause of the rot, the *Cladosporium* and the *Macrosporium* having appeared later as saprophytes. In its characters this fungus closely approaches (and may be identical with) *Ascochyta citrullina*, which is the conidial form of *Mycosphaerella citrullina*. This fungus causes a serious disease of melons in the United States, but the perithecial stage has not yet been found in this country, and in view of the fact that the tomato is an annual it is not clear how the disease is propagated from one year to another. It is suggested by the writers, however, that the mycelium may hibernate in the dead tissues of affected plants, which if left on the ground instead of being burnt may be the means of reinfection if plants are set out on the same plot the following year. There is no evidence that the fungus is propagated in the seed. On outdoor plants the disease does not seem to develop until almost fully grown,

and even then appears at present to be scanty and sporadic, hence it is not likely to become a serious pest to growers of outdoor tomatos. In the case of tomatos grown under glass, however, this fungus may cause a severe epidemic, as already pointed out by Massee (*Kew Bulletin*, 1909), on account of the conditions of growth being so favourable for its development. It may be mentioned that this fungus is included in the list of pests scheduled by the Board of Agriculture, under the Destructive Insects and Pests Acts.—*F. C.*

Trees and Shrubs, Some Important Insects of Illinois Shade. By S. A. Forbes (*U.S.A. Exp. Stn., Illinois, Bull.* 151; Oct. 1911; 67 figs.). Some twenty-five more or less destructive insects are described, with the best methods of prevention and control.—*V. G. J.*

Trees, Notes on Diseases of. By G. G. Hedgcock (*Phytopathology*, ii, pp. 73-80; April 1912).—These are mostly notes on the native trees attacked by certain parasitic fungi in the United States. The fungi dealt with are *Polyporus dryophilus* associated with the piped rot of oak; *Fomes Everhartii*, of which *F. nigricans* is a depauperate form, also causing rotting of oak and many other trees; *F. igniarius* causing white rot; *Polyporus texanus*, causing a mottled brown and white heart-rot; *Fomes applanatus*, *F. fasciatus*, *Polyporus sulphureus*, *P. Schweinitzii*, *Fomes fraxinophilus*, *F. robinae*, all of which occur on deciduous trees. On conifers *Trametes pini* is the most destructive, *Polyporus Schweinitzii* ranking next. *Fomes roseus*, *F. laricis*, *Echinodontium tinctorum*, *Polyporus sulphureus*, *Fomes pinicola*, *Polyporus amarus*, *Lentinus lepideus*, and *Hydnum coralloides* also cause rots of various types on coniferous trees. Lists of hosts are given in every case.—*F. J. C.*

Tropaeolum peregrinum, The Production of Hairs on the Stems and Petioles of. By A. W. Hill (*Ann. Bot.* xxvi. pp. 589-592; April 1912; 1 plate).—An interesting paper giving an account of the production of hairs on the stems and petioles of the Canary Creeper (*Tropaeolum peregrinum*). The phenomenon was first observed on plants whose leaves had been eaten by snails. Subsequent experiments proved that hairiness could be induced by removing the laminae of the leaves. The artificial production of an alternately glabrous and hairy condition is thus possible. The structure of the hairs is described and also their mode of origin.—*A. D. C.*

Turkestan, Conspectus of Flora of. By Olga and Boris Fedtischenko (*Beih. Bot. Cent.* Bd. 28, pp. 226-277).—This paper is a continuation of this Flora and contains part of the Compositae (*Eupatorium* to *Senecio*).—*G. F. S. E.*

Ustilagineae and Uredineae of Ceylon. By T. Petch (*Annals Roy. Bot. Gard. Peradeniya*, v. p. 223).—An enumeration with descriptions of 120 species of these parasitic fungi, several of which are new.—*F. J. C.*

Ustilagineae, Life History of. By F. Rawitscher (*Zeitschr. f. Botanik*, Bd. iv. Heft 10; 1912).—The writer, from his careful investigation of the structure and development of the spores in various species of *Ustilago*, has succeeded in clearing up several points in the life-history of this genus of Smut Fungi. He confirms the statements of Dangeard and Lutman that in the spore development of the Smuts a fusion of two pairs of nuclei takes place. The mycelium of *Ustilago Carbo* (parasitic on oats) shows a pair of nuclei in each cell; the young spore also has two nuclei, and owing to the fusion of these the mature spore becomes uninucleate. In the Maize Smut (*U. Maydis*) the secondary spores (sporidia) do not undergo copulation, and the mycelial cells have but one nucleus; but just before spore formation these cells become binucleate by the breaking down of a wall between two neighbouring cells, hence the young spore has two nuclei. These cytological details are, of course, of theoretical rather than practical interest, but the writer has also investigated the mode of infection of the host-plants by the germinating spores, and gives a number of interesting new illustrations showing the mode of entrance of the infecting germ-tubes.—*F. C.*

Water-Cress, To Grow, in Tubs (*Rev. Hort. Belge*, p. 253; Aug. 1, 1911).—A method of growing water-cress in tubs for private consumption is described, and is said to be perfectly successful. The tub should be placed if possible in a shady place and filled with clean water. A wicker sieve should be put to float on the water, and in it several clumps of water-cress. A fortnight or three weeks afterwards the tub is full of green stuff, and one may begin to gather some of the young shoots. The water may, if preferred, be renewed from time to time, but the great point is to keep the tub quite full. To help on the growth of the plant it is well, every twenty days or so, to spread on the surface of the water a mixture of 5 grammes ammonia sulphate and 125 grammes iron sulphate to each 10 litres of water. Water-cress may be gathered in this way all the year round.—*M. L. H.*

Watsonia Meriana var. iridifolia. By A. J. Ewart (*Jour. Dept. Agr., Victoria*, x. p. 359; June 1912).—This beautiful plant is a troublesome weed in some parts of Victoria. Animals eat it readily, and it had been reputed poisonous, but experiments have failed to demonstrate any poisonous properties. A description is given.—*F. J. C.*

West Indies, Agricultural Education and Instruction in the (*West Indian Bull.* vol. xi. No. 4, p. 439; 1911).—This is carried on in most of the Colonies far more thoroughly than at home, for in an early part of this Bulletin Sir W. T. Thiselton-Dyer writes: "Lastly, but by no means least, an efficient system of rural education has been organized for the negro peasantry. I have no hesitation in saying that it is far in advance of anything which exists in the country where I am writing. . . ."—*C. H. L.*

West Indies, Entomology in the. Anon. (*West Indian Bull.* vol. xi. No. 4, p. 282; 1911).—After his appointment, the duties of the first entomologist on the staff of the Department were "to visit, give lectures, and recommend suitable measures for the treatment of the numerous insect pests that are so destructive to cultivated crops in the West Indies." Later he had charge of the laboratory and collections at headquarters, and all investigations and operations in the various colonies.

The insect pests affecting sugar-cane, cotton, cacao, sweet potato, and other crops were studied, and their life-history ascertained. Chemical insecticides (preventive and remedial) were applied. In some cases, a parasitic enemy of the insect was brought into use, and, generally, valuable information was placed within the reach of the cultivators.—*C. H. L.*

West Indies, General Progress in, since 1897 (*West Indian Bull.* vol. xi. No. 4, p. 427; 1911).—In 1897 the sugar industry was threatened by the competition of bounty-fed beet. The cacao industry was small, and the cultivation of limes was carried on in a small way in two or three colonies.

The removal of the bounties of beet-sugar gave new life to West Indian cane-sugar, and fresh capital caused better cultivation of estates, the erection of central factories with improved machinery, and new outlets for the products.

The introduction of Sea Island cotton-growing formed an alternative industry to that of sugar, hitherto the sole resource of the islands.

The cultivation of rice, limes, cacao, and fruit have all assumed increased proportions and added prosperity. Barbados may perhaps remain alone in the field in supplying molasses (Muscovada system), as its rival, Porto-Rico (under American protection), is adopting more modern machinery for the production of crystal sugar in vacuum pans.

Canada, by giving preferential treatment in her markets to British-grown sugar, reduces the dependence which formerly existed on the American market in the case of Barbados and Antigua.—*C. H. L.*

West Indies, Ten Years Mycology in the (*West Indian Bull.* vol. xi. No. 4, p. 318; 1911).—This part of the West Indian Bulletin is a summary of mycological work in the West Indies, and is as important in its relation to the crops concerned as is entomology. The fungoid diseases are divided as they affect roots, stems, leaves, and fruit, and the study of the disease is completed by the study of the treatment required.—*C. H. L.*

West Indies, The Imperial Department of Agriculture in the. By Sir Daniel Morris (*West Indian Bull.* vol. xi. No. 4, p. 232; 1911).—Much satisfaction has been caused in the West Indian Colonies by the decision of the Home Government to maintain the Central Office of the Imperial Department of Agriculture for another ten years.

This department has been instrumental in bringing about an immense improvement in the commercial and financial condition of these Colonies, which include the British West Indies, Bahamas, and Bermuda, together with British Honduras and British Guiana.

As our oldest tropical possessions they have an interesting history, and are still capable of further expansion through the application of capital and energy.

The opening of the Panama Canal will undoubtedly increase their strategic and economic importance, the islands offering valuable sites for docks and coaling stations, as they form a half-way house between Europe and Eastern Asia, also between Europe and Australasia.

The Department was created as the result of a Royal Commission held in 1897, one of whose chief recommendations was the "organization of a scientific department to assist the sugar industry and encourage, where possible, minor agricultural industries, together with an improvement in the cultivation of the principal crops." This suggestion, together with others, was carried out, and the present prosperous condition of the West Indies as compared with their former depression and distress may be attributed to the following factors:

(1) The revival of confidence in the sugar industry as the result of the abolition of bounties, and improved trade relations with Canada.

(2) The increase in the production of cacao in Trinidad, Granada, and Jamaica.

(3) The development of the American fruit trade in Jamaica.

(4) The introduction of Sea Island cotton into St. Vincent, Barbados, and the Leeward Islands.

(5) The extension of the cultivation of limes in Dominica, of rice in British Guiana, and of tobacco in Jamaica.

Amongst beneficent developments are the establishment of central sugar factories, experiments with new seedling canes, investigations into diseases and injurious insects, local and experimental stations, travelling inspectors, distribution of economic plants, agricultural teaching in schools, &c.—*C. H. L.*

West Indies, Work in the Botanic and Experiment Stations from Year to Year (*West Indian Bull.* vol. xi. No. 4, p. 351; 1911). This section of the West Indian Bulletin gives accounts of economic experiments with staple crops, as well as with subsidiary and miscellaneous crops.

In Grenada the staple crop is cacao, but judging from experimental trials, both cotton and rubber are likely to become of great agricultural importance, especially the latter. Many different kinds of rubber-yielding plants were tried, among them *Castilloa elastica*, *Hevea brasiliensis*, and *Funtumia elastica*. The first and last are very susceptible to attacks by scale insects, the Hevea proving the most satisfactory. Plants of this species, barely three years old, attained a height of 20 feet.

Rubber is also gaining increased attention in St. Vincent, and here the Assam and Para trees were those most free from pests and diseases. The staple crops are cotton and arrowroot.

In Barbados sugar and cotton made great strides.

St. Lucia (with sugar and cacao as staple crops) is building up a progressive lime-fruit industry, which fruit has also been re-established in Montserrat since the destruction wrought by hurricane in 1899. The staple crop here is cotton.

Dominica grows spineless limes, first shipping citrate of lime to England in 1906-7.

Rubber plantations are increasing. The Castilloa did not suffer from a severe gale in 1903-4, as did Funtumia, but the samples were inferior to Para rubber shipped at the same time (1907-8). For coagulating the Hevea latex lime-juice was used. Hevea is easier to tap than the others mentioned.

In Antigua sugar-cane cultivation had fallen very low, but has been made the subject of thorough investigation as to seedling varieties, treatment of disease, manurial experiments, "plants" versus "ratoons," soil analysis, meteorological records, &c., with the result that decadence has been arrested and prosperity restored.

In St. Kitts sugar and cotton are the staple crops.

In Nevis cotton and sugar, in order of importance.

In the Virgin Islands cotton is the staple; sugar and limes are subsidiary crops.—*C. H. L.*

White Flies Injurious to Citrus in Florida. By A. W. Morrill, Ph.D., and E. A. Back, Ph.D. (*U.S.A. Dep. Agr., Bur. Entom., Bull.* 92; July 1911; 10 plates, 19 figs.).—This bulletin includes the principal results of studies of the two species of white flies most destructive to Citrus in the United States, *i.e.* Citrus White-fly (*Aleyrodes citri* R. and H.) and the Cloudy-winged White-fly (*Aleyrodes nubifera* Berger).—*V. G. J.*

Woodland, An Ecological Study of a Cambridgeshire. By R. S. Adamson, M.A., B.Sc. Edin., B.A., Camb. (*Jour. Linn. Soc.* vol. xl. No. 276, pp. 339-384; Feb. 1912; plates 12-17 and 1 text fig.).—A study of the ecology of Gamlingay Wood situated in the extreme west of Cambridgeshire. Geologically it is placed upon the boulder clay, above gault and lower greensand. This gives rise to two types of soil in the wood: a heavy calcareous clay and a non-calcareous loam. The vegetation of these two soil-types is quite different. The calcareous soil supports an *Ash-Oak wood* association, while the non-calcareous loam gives rise to an *Oak wood* association. The *Ash-Oak* association is the most extensively developed type of woodland on calcareous clays and marls in the South of England. The ground flora of each association is divided into plant societies, which are determined mainly by the soil-moisture, the intensity of light, and the rate of evaporation. The chief societies of the *Ash-Oak* association are dominated by *Spiraea Ulmaria*, either pure or

mixed with *Deschampsia caespitosa*, and by *Mercurialis perennis*. The societies of the *Oak wood* association are dominated by *Holcus mollis* and *Pteris aquilina*, and by *Holcus mollis* alone. The conditions of water contents of soil, intensity of light, &c., characterizing each of these societies is analyzed. It was found that those plants whose structure was most capable of modification by the varying conditions of life were able to withstand a great range of conditions.

R. B.

Wood of Dying and Dead Trees, Insect Injuries to the. By A. D. Hopkins (*U.S.A. Dep. Agr., Bur. Entom., Circ.* 127; Dec. 1910).—" Timber dying from insect attack and other causes, including fire, disease, storms, &c., is attacked by certain wood-boring insects which extend their burrows through the sound sapwood and heartwood, and thus contribute to the rapid deterioration and decay of a commodity which otherwise would be available commercially during periods of from one to twenty years after the death of the tree."

Fire-killed and storm-felled pine, fir, spruce, &c., are in particular attacked by the boring larvæ known as " sawyers," which, after feeding on the inner bark for a time, extend their large burrows into the heartwood.

Timber-beetles make pin-holes in the sapwood, which render the wood defective and encourage a wood-staining fungus to which the holes give entrance.

Great damage is done to the wood of hickory, ash, oak, and chestnut by the round-headed wood-borers (*Cerambycidae*), timber-worms, and ambrosia beetles, the wood being frequently reduced in value 10 to 25 per cent.

Injury may be prevented by (1) prompt utilization of such timber after it is dead or past recovery; (2) removal of the bark from the merchantable portions of the timber as soon as possible; (3) felling the trees and placing the unbarked logs in water.—*V. G. J.*

Wood Preservatives and Quantity of Wood treated in the United States in 1910, Consumption of. By H. S. Sackett (*U.S.A. Dep. Agr., Forest Service, Circ.* 186; Aug. 2, 1911).—This is an account of how rapidly the treatment of timber by impregnating with various chemicals has come about in the United States. In 1909 there were no less than eighty commercial plants for treating timber in this way.—*A. D. W.*

Zinc ortho arsenite as an Insecticide. By R. A. Cooley (*Jour. Econ. Entom.* V, pp. 142-146; April 1912; figs.).—Ortho-arsenite of zinc is a white, fluffy, finely divided powder, mixing well with water after rubbing into a paste. It spreads as well as arseniate of lead, and much better than Paris green. The samples tested contained less water-soluble arsenic than either Paris green or arseniate of lead, and it is intermediate in strength between these two. In suspension it settles rather more quickly than arseniate of lead but the addition of soap

retards the settling markedly. In one test more of the compound settled out in fifteen minutes without soap than in fifteen hours with it. Whereas in the case of most arsenical compounds some injury to the bark is apparent, none appears to be caused by this substance.

Used at the rate of 1 lb. to 50 gallons of water, it was sprayed on potatos as a poison for Colorado beetles with quite satisfactory results. Cabbages were also sprayed to rid them of the cabbage butterfly caterpillar and the diamond-back moth, 3 lb. to 100 gallons being used with entirely satisfactory results. Its cost is 20 cents per lb. retail.—*F. J. C.*

WISLEY SCHOOL OF HORTICULTURE.

Forty-three students attended the R.H.S. School of Horticulture at Wisley during the past year. Seven completed their two years' course during the year and sat for the Diploma, the requirements for which, besides the examinations (written and practical) in both principles and operations of horticulture, include the preparation of an essay upon an approved subject, the preparation of collections of British plants and insects useful or injurious in horticulture, and credit for observation during the two years' course. Mr. J. Fraser, F.L.S., acted as external co-examiner with the Director and the Superintendent.

Five candidates satisfied the Examiners, their names, in order of merit, being:—

1. Mr. C. T. Mackintosh.
2. Mr. J. B. Harris.
3. Mr. T. Johnson.
4. Mr. C. Jeffery.
5. Mr. W. D. Hitchcock.

Nineteen students passed the Society's general examination in April 1912.

One student sat for the special examination for teachers and passed in Class I., Mr. I. G. Briggs.

The following prizes (books) were awarded on the results of the Diploma examination:—

Prizes provided by the income of the "Sutton Prize Fund," of the value of £1 10*s*., £1 2*s*. 6*d*., and 17*s*. 6*d*., to Messrs. C. T. Mackintosh, J. B. Harris, and T. Johnson respectively.

"Nicholson Prize," of the value of £2 2*s*. (provided by the income of the "Nicholson Memorial Fund"), for observations on the Flora and Fauna of Wisley and its neighbourhood, to Mr. C. T. Mackintosh.

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

January 9, 1912.

Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., in the Chair.

Fellows elected (71).—Mrs. Allen, Miss E. Baker-Baker, Mrs. Roy Batty, Mrs. R. H. Beddome, Mrs. G. Beetham, G. F. Bevis, W. E. Blackburn, J. Bray, G. A. Brown, L. W. Butcher, Miss M. L. Campbell, Mrs. L. Cator, Dr. Maud M. Chadburn, Miss M. B. Cockshutt, E. B. Cook, H. Cook, Mrs. L. E. Creasy, H. Dalton, A. R. de Lissa, M. B. de Siebert, the Lady Margaret Duckworth, Mrs. Farnham, Mrs. R. W. Forbes, R. Freer, Miss A. Taubman Goldie, W. Good, R. Grace, W. S. Greaves, Mrs. Harwood, H. E. Hayes, Mrs. E. Hoffgaard, H. Hogbin, Rev. R. W. Carew Hunt, H. L. Hunt, W. Hurry, Mrs. J. Carter Jonas, Mrs. Luckhurst, Mrs. McLaughlin, Mrs. Macnab, Mrs. Maxwell, Miss A. G. Munn, Mrs. Murray, C. B. Oldfield, C. A. G. Parris, Miss L. I. G. Parry, Mrs. Parsons, Rev. R. C. Patten, Major C. E. Pemberton, Miss Pontet, W. Primett, E. S. Rayner, Mrs. Ritchie, Mrs. W. T. Robinson, W. M. Roscoe, J.P., Mrs. Rowse, G. E. Sewell, M. Simon, Mrs. F. Seth-Smith, R. V. Smith, Miss R. Stephenson, Miss C. M. Styan, Miss E. O. Swan, F. W. Theobald, Commander P. G. Tillard, R.N., A. C. Vachell, G. W. Webster, Mrs. Welch, Mrs. F. Weston, H. Wight-Boycott, H. V. Woodgates, F. Wyer.

Fellows resident abroad (3).—Wilhelm J. Beltz (Cologne), Miss Guille (Guernsey), Rudolf Mann (Germany).

Associates (3).—E. G. Drower, J. Stallan, H. van Waveren.

Society affiliated (1).—Aldersbrook Horticultural Society.

GENERAL MEETING.

January 23, 1912.

Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., in the Chair.

Fellows elected (60).—F. Alexander, Miss Baring-Gould, W. J. Barnes, Mrs. Guy Bethell, S. W. Bettridge, Mrs. Birchall, Mrs.

Blyth, Mrs. Bourne, Mrs. H. Brocklebank, Mrs. A. Buchanan, Miss L. Bullivant, Miss Carrol, Viscountess Castlereagh, Mrs. Chappell, Miss Christie, C. W. Clark, H. E. Corke, J. G. Covington, the Earl of Craven, Mrs. A. Cross, Mrs. H. Dean, Miss F. Ede, L.S.A., A. G. Falkner, Mrs. W. Farquhar, Hon. Mary Fremantle, A. C. Fowler, Mrs. A. E. George, A. Harvey, D. C. Hogan, Mrs. W. Hutchinson, Mrs. F. Hulbert, G. Hunter, R. W. Ivens, Miss M. H. James, E. Peter Jones, J.P., J. W. Kenworthy, Mrs. C. Lindo, Miss G. Lloyd, Mrs. Macgregor, Miss E. L. Manning, Miss Montizambert, Mrs. A. Miller, Miss R. S. Nicholson, M. Pinder, A. W. Prince, Miss E. D. Roberts, Mrs. Roupell, Miss Rouquette, T. M. Sarsfield, J.P., Mrs. Scott-Robson, W. F. E. Seeley, Mrs. Solomon, Miss M. Thornton, G. A. Touche, M.P., Mrs. Twentyman, Lady Waldie-Griffith, F. F. Ward, Mrs. C. Watson, Mrs. C. W. Woodall, Mrs. J. Younger.

Fellows resident abroad (2).—J. L. Burgess (Raleigh, U.S.A.), K. J. Nath Singh (Moradabad, India).

Associates (2).—W. Ludbrook, R. Raine.

Societies affiliated (2).—Ely Horticultural Society, Morriston Cottage Garden Society.

GENERAL MEETING.

FEBRUARY 6, 1912.

Sir TREVOR LAWRENCE, Bart., K.C.V.O., V.M.H., in the Chair.

Fellows elected (89).—G. H. Alston, H. Atkinson, Captain R. L. Bagge, Hon. Mrs. F. Bailey, Mrs. J. J. Barrow, T. Bell, J. H. Billinghurst, Mrs. R. Blenkinsop, Mrs. C. Brocklebank, Lady Camoys, Mrs. Carew-Robinson, Miss M. Carter, Miss A. M. Chads, H. Charman, E. Clark, J.P., C. H. Clegg, Major R. C. Coates, F. Crawford Cobb, Mrs. Conyers, Mrs. F. L. Cox, T. A. Coysh, Lady Cranworth, C. F. Crump, G. Cuthbert, Dr. M. Davies, E. J. Davis, Countess of Donoughmore, G. R. Downer, Mrs. R. W. Doyne, Countess of Drogheda, Miss M. E. S. Durand, Lady Elphinstone, W. F. Emptage, Mrs. Stephen Ewen, H. Fletcher, C. J. Flight, W. H. Forder, Mrs. B. Foster, Rev. C. Fulmer, P. Goodacre, Mrs. R. L. Gunther, Miss L. V. Haughton, Mrs. Charles A. Head, Miss H. Hichens, Miss E. W. Horne, G. Howcroft, Miss M. Jackson, Mrs. A. H. Jessel, Mrs. W. Jones, T. W. Whitmore Jones, W. J. Kaye, Mrs. A. Kant, F. Lace, E. G. M. Mareseaux, Mrs. H. L. Mather, Miss Morgan, Mrs. C. Morland, S. H. Morris, W. Morse, Miss G. Murray, Mrs. V. Nisbet, C. H. Oldham, S. Penhaul, Miss D. A. Percival, Dr. H. W. Phillips, Mrs. Preston, G. H. Read, A. Rex, S. Rex, Mrs. R. K. Ritchie, R. K. Ritchie, C. I. Robin, Mrs. W. I. P. Robinson, E. A. G. Rogers, Mrs. F. Rooper, G. Roper, Hon. Mrs. B. Russell, Mrs. E. H. Sawbridge, Miss G. Seymour, W. R. Sheldon, E. M. Smith, Mrs. W. Lepard Smith, Miss L. Smith-Bosanquet, Miss

J. Stacey, F. C. Stewart, J. Stormonth, Miss C. M. Ward, C. Aubrey Watts, G. R. A. Wilson.

Fellows resident abroad (5).—T. I. Beatson (Sydney, N.S.W.), Leonard Box (Dorchester, Canada), A. A. Manda (U.S.A.), R. E. Massey, Ph.C. (Khartoum, Egypt), R. F. Murchison (Italy).

Associates (25).—Miss E. Allen, Miss D. Bagnall, E. Blackwell, W. Blackwell, Miss P. Brightman, S. Cluett, Miss H. Edwards, Miss R. Elliott, Miss D. Gibbings, Miss R. Gribble, Miss C. Hanbury, Mrs. M. Hellet, Miss L. Joshua, Miss L. Macker, Miss B. Mitchell, Miss M. Partridge, Miss M. Rivett, Miss M. Rudolf, Miss J. Smith, T. Smith, Miss H. Thrupp, Miss J. Turner, Miss C. Ure, Miss E. Weston, J. Waterworth.

Societies affiliated (5).—Brighton, Hove and Sussex Horticultural Society, Chiswick Horticultural Society, Harringay Park Horticultural Society, Masterton (N.Z.) Agricultural and Pastoral Association, Southampton and District Gardeners' Mutual Improvement Society.

A lecture on "Plant Life in a Tropical Island" was given by Sir Everard F. im Thurn, K.C.M.G., C.B. (see p. 1).

ANNUAL GENERAL MEETING.

February 13, 1912.

Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., in the Chair.

Fellows elected (37).—Lord Abinger, Mrs. W. C. Boyd, W. Burgess, Rev. J. Campbell, F. C. Collingwood, Miss H. S. Cooper, P. H. Cousens, Dr. A. G. C. Cressy, C. Davies, Mrs. D. Davies, J. R. Drake, Dr. W. d'Este Emery, Miss D. Evans, Miss M. Evans, Miss M. I. Friend, Mrs. E. Green, Miss M. Groves, A. G. Gumpert, Miss Joan Hony, Mrs. T. S. Howard, Mrs. C. A. Ironside, Mrs. F. Jerdein, G. U. Jowett, G. H. Kitchin, Mrs. H. C. Lassam, J. D. Lees, Mrs. H. Lindsay, Rev. H. E. St. John Macdonald, Mrs. A. C. Mead, G. A. Miles, Miss M. Naylor, W. Rooking, A. M. W. Shakespear, J.P., E. Smart, A. Smith, Lady Enid Vaughan, C. Wall.

Fellow resident abroad (1).—F. V. Clerk (Upper Burma).

Society affiliated (1).—Sutton Adult School Horticultural Society.

The President moved the adoption of the Report of the Council for 1911. This was seconded by the Treasurer and carried unanimously.

The Rev. G. H. Engleheart observed that the number of **F.C.C.** awards made during 1911 showed no increase over those of 1905, although the number of exhibits was probably greater. Those awarded to Orchids amounted to 82 per cent. of the total number recommended, which seemed hardly fair to the importance and beauty of other subjects.

Mr. Engleheart further suggested that the Gold Medal be made in two grades—large and small—to differentiate between degrees of gold medal excellence.

The President replied that the awards were made by the Council on the recommendation of the respective committees, which were composed of experts on the matters under their special surveillance.

The following names of President, Vice-Presidents, Members of Council, and Officers having been duly proposed and seconded, the list circulated in accordance with Bye-Law 74, and no alternative names having been proposed, were declared by the Chairman to be elected, viz.:—

As new Members of Council.—Baron Bruno Schröder, Mr. W. A. Bilney, J.P., Mr. Harry J. Veitch, F.L.S., V.M.H.

As Vice-Presidents.—The Duke of Bedford, K.G., F.R.S., the Rt. Hon. Joseph Chamberlain, F.R.S., the Rt. Hon. the Earl of Ducie, F.R.S., the Rt. Hon. Lord Rothschild, Leopold de Rothschild, Esq., C.V.O., Sir John T. Dillwyn Llewelyn, Bart., V.M.H.

As Officers.—Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H. (President), J. Gurney Fowler, Esq. (Treasurer), the Rev. W. Wilks, M.A. (Secretary), Mr. Alfred C. Harper (Auditor).

The Victoria Medal of Honour was conferred on Lieut.-Colonel D. Prain, F.R.S., and Mr. Ernest H. Wilson.

Sir John Llewelyn proposed a vote of thanks to the President, which was seconded by the Rev. G. H. Engleheart and carried unanimously.

REPORT OF THE COUNCIL
FOR THE YEAR 1911.

1. **The One Hundred and Eighth Year.**—During the past twelve months the Society has experienced a further continuance of the general progress which has characterized the last quarter of a century.

2. **Wisley Gardens.**—In common with most gardens having sandy soils in the South of England, the Society's Garden at Wisley suffered from the exceptionally hot and dry summer. The heavy rains of October, November, and December have been most welcome. A large Rock Garden, including a small Bog Garden and a miniature Moraine, has been constructed by Messrs. Pulham. It covers what was formerly a rough grass-grown hill above the Water Lily pools in the south-west corner of the old garden, to which it will, when fully planted, make a most attractive addition. The planting has been begun, but is necessarily a somewhat lengthy proceeding, and the full effect of the new work will hardly be apparent until the plants have had some years' growth. It should be remembered that the garden is not designed to afford the most artistic arrangement of stonework, so much as a suitable home for rock and alpine plants. The Council gratefully acknowledge the gifts of rock plants from Sir Frank Crisp and Mr. E. A. Bowles, and of ferns from Mr. W. Marshall, V.M.H. A special Foreman, Mr. D. Sarsons, lately Rock Gardener at Wretham

Hall, Norfolk, has been placed in charge of this department, and the Council have full confidence that under his superintendence it will soon be an object of interest and instruction to the Fellows.

3. **School of Horticulture and Laboratory.**—The valuable practical and scientific educational work being conducted at Wisley is becoming more and more widely recognized. Its position is in some respects unique, there being in many places too great a tendency to look upon *information about* gardening as the one thing to acquire, instead of a *knowledge of* gardening. The Council are convinced that the young horticulturist, to be started on the right lines for his future development, should both be equipped with (1) a sound knowledge of the scientific principles underlying his craft, and also have acquired (2) a considerable degree of and appreciation for technical skill, which can only be derived from the actual and continual performance of the various operations. The more closely these two are connected with one another in time and place the more capable each is of aiding the other, and this is the aim of the Student's Course inaugurated at Wisley in 1907.

During the past year Sir Albert Rollit, as a Member of the Senate of the University of London, and also a Member of the Council of our Society, has been endeavouring to secure the University's recognition of our School of Horticulture at Wisley. The matter has made considerable progress and hopes are entertained of its reaching a successful issue, though as yet it is too soon to speak at all confidently.

The increased demands upon the time of the Director, and the necessity for his constant presence at the gardens to watch experimental work, has necessitated both the appointment of an Assistant Lecturer—Mr. Arthur S. Horne, B.Sc., F.G.S.—and also the building of a house on the spot for the Director.

4. **Diploma in Horticulture.**—The Council have requested the following gentlemen to act as a committee to inquire into the desirability of establishing a National Diploma in Horticulture, and if it is thought desirable, to recommend what steps should be taken for the purpose:—

The Right Hon. A. H. Dyke Acland (Chairman), Mr. W. Bateson, M.A., V.M.H., F.R.S., Mr. E. A. Bowles, M.A., Mr. F. J. Chittenden, F.L.S., Professor J. B. Farmer, D.Sc., F.R.S., Mr. C. R. Fielder, V.M.H., Mr. W. Hales, Mr. J. Hudson, V.M.H., Professor Keeble, Sc.D., Sir Daniel Morris, K.C.M.G., V.M.H., Lieutenant-Colonel D. Prain, D.Sc., F.R.S., Sir Albert Kaye Rollit, D.C.L., Litt.D., Mr. H. J. Veitch, V.M.H., and Mr. Walter P. Wright.

5. **Shows, 1911.**—The Spring Bulb Show, and the Temple Show were as successful as ever. Notwithstanding the very dry summer, the Vegetable Show proved a decided advance on the first one, held in 1910, the date being more suitable. The autumn Fruit Show,

occurring on one of the regular fortnightly Tuesdays, was visited by many more Fellows than usual, and the display of Apples in particular was quite extraordinary for size, as well as for colour and quality.

The intense sunshine which blazed over the Summer Show at Olympia was very trying to visitors as well as to the flowers, the latter being almost dried up before the first day of the Show was over. It is, however, satisfactory that the loss on the Show was but small, notwithstanding the unusually heavy expenses. The Council are glad to say that they have been able to arrange for the Summer Show in 1912 to be again held at Holland House, and for three days instead of two only as heretofore, the actual dates being July 2, 3 and 4.

6. **The Coronation Cup.**—In celebration of the Coronation of their Majesties King George and Queen Mary, Patrons of the Society, the Council caused a special Silver Gilt Challenge Cup to be designed at a cost of Sixty Guineas. It will generally be offered for competition at the Summer Show, and will be adjudged directly by the Council to whatever in their opinion is the best exhibit in the Show. A small replica of the Cup will each year be given to the winner, together with the custody of the larger cup for twelve months.

7. **Masters Lectures.**—The fifth and sixth lectures in memory of the late Dr. Masters were delivered by Mr. G. F. Scott Elliot, M.A., B.Sc., on "Single Seed Selection" and "The Changing of Species" (see R.H.S. JOURNAL, vol. xxxvii. pp. 1-14).

Professor I. Bayley Balfour, F.R.S., V.M.H., will deliver the Masters lectures in 1912 on May 14 and June 4. Subjects: (1) "Gardening and Drought"; (2) "Problems of Propagation."

8. **Deputations.**—A Deputation from the Council consisting of Sir Albert Kaye Rollit, D.C.L., LL.D., Litt.D., and Messrs. E. A. Bowles, G. Bunyard, J. Hudson, H. B. May, and the Rev. F. Page Roberts, attended the Summer Show of the North of England Horticultural Society at Harrogate on August 15, and made awards. The Council desire to acknowledge the very hospitable reception accorded by Lord Faber, J.P., D.L., and Major Dent, J.P. The Council were also represented by Mr. Jas. Hudson and Mr. F. J. Chittenden at the N. E. H. S. second Fruit Congress at Newcastle-on-Tyne last November, and have accepted an invitation to send a Deputation to the Leamington and County Flower Show, to be held on July 24 and 25, 1912.

9. **Library.**—The Annual Report for 1910 recounted the steps which had been taken by the Council and Trustees to secure a closer identification of the Lindley Library with the Society, whilst at the same time preserving it as a perpetual Trust. This action paved the way for the appointment of a Special Library Committee, which now consists of Messrs. J. T. Bennett-Poë, E. A. Bowles, E. A. Bunyard,

J. Gurney Fowler, Dr. Daydon Jackson, J. R. Loewe, Arthur Paul, Harman Payne, Harry J. Veitch, and Rev. W. Wilks. The Committee meets fortnightly and recommends to the Council the acquisition of desirable new or rare old books which may happen to be obtainable at the moment, together with those suggested by any of the Fellows. About 300 volumes have been purchased this year, amongst them being Redouté's "Les Liliacées"; Dr. M. C. Cooke's "Original Notes and Drawings of Parasites of Cultivated Plants"; Sibthorp's "Flora Graeca"; Mas' "Pomologie"; "Pomologie de la France"; Mas' "Le Verger"; Besler's "Hortus Eystettensis"; Bury's "Hexandrian Plants"; Trew's "Plantae Selectae"; Descourtilz's "Flore des Antilles"; Maund's "Botanic Garden"; Andrews' "Heathery"; and many others. The amount expended on books has been between £800 and £900. The whole Library is being rearranged, classified, indexed, and catalogued under the supervision of Messrs. Wesley.

The necessity of putting up additional book-cases having come to the knowledge of Baron Bruno Schröder—nephew of the late Baron, who so generously fitted up the Library at his own expense—Baron Bruno offered to take upon himself the provision of the new oak cases, in order that the whole of the furnishing of the Library might continue to be identified with his family's name. The total cost exceeded £100. The Council greatly appreciate this most kind generosity.

10. **Plant Nomenclature.**—The rules adopted by the Brussels Horticultural Congress, held in April, 1910, on plant nomenclature, have been published in the JOURNAL of the Society, vol. xxxvii. pt. 1, p. 140; and the Standing Committees have been requested to adopt them in the Society's work. Fellows, and especially Exhibitors, are asked to make themselves familiar with these rules for naming their plants, and to act on their guidance, as by so doing they will materially help to clear up that confusion and duplication of names which not only cause so much difficulty in horticultural work, but is also productive of not a little disappointment and soreness to buyers.

11. **Plant Collector.**—The appointment of a Plant-Collector will be considered by the Council at an early date.

12. **The Exhibition Hall and Lecture-room.**—The Hall has been redecorated in plain green and white colours.

Inner casement windows have been fixed in the Lecture-room to help to exclude the distracting street noises, and an electric fan ventilation system has been installed, the atmosphere of the room being greatly improved thereby.

13. **Judging Rules Revised.**—The Society's Code of Rules for Judging, with suggestions to schedule-makers, has been further revised, and the new edition may be obtained from the Society's Office, price 1*s.* 6*d.*

14. **Pocket Diary.**—In the early part of the year the Council requested the Secretary to prepare a Gardeners' Pocket Diary for 1912. This has been done, and it is hoped that it may prove useful to many. It contains much information valuable to gardeners—both amateur and professional. It may be obtained from the Society's Office, price 1*s.* 1*d.* in cloth, or 2*s.* 1*d.* in leather binding. The Secretary would feel very grateful to any of the Fellows who will give him any suggestions for further improving the issue for 1913.

15. **Luncheon to Colonial Visitors.**—Taking advantage of the opportunity afforded by the presence of many colonial visitors in London for the King's Coronation, the Council invited a large number of gentlemen from the Dominions and the Colonies to luncheon at the Olympia Flower Show; about 130 were present, and the speeches testified to the esteem in which the Society's work is held in the Colonies. A full report was issued in the JOURNAL, vol. xxxvii. part 2.

16. **Transactions.**—At the last Annual Meeting it was suggested that, in addition to the present JOURNAL, "Transactions" should be issued from time to time, devoted exclusively to scientific matters, and sent to those only of the Fellows who would like to subscribe an additional £1 1*s.* a year for the purpose. A communication was therefore sent to all the Fellows of the Society setting forth the proposal, but as less than 60 favourable replies were received out of 12,000 Fellows, the Council have decided to allow the proposal to stand over, at least for the present.

17. **Special Shows in 1912.**—Several special exhibitions are to be held in 1912. That for forced Spring Bulbs is fixed for March 5 and 6. On April 16 and 17 a Daffodil Show will be held; and the Vegetable and the Fruit Shows on September 24 and October 10 and 11 respectively. A two-days' show of Orchids will also be held on November 5 and 6, in order to demonstrate the autumn blooming possibilities of many of these beautiful and interesting plants.

18. **International Horticultural Exhibition, May 22–30, 1912.**—Most of the Fellows of the Society will have already heard that an Association has been formed to organize an International Flower Show in London next Spring, as the outcome of a suggestion, made by the Council in their Report for the year 1909, that such a courtesy on the part of Great Britain was due (or indeed overdue) to the Continent and to America for the many similar hospitalities which foreign countries have so frequently offered to British horticulturists.

It must be fully understood and constantly borne in mind that our Society is not organizing this Exhibition, nor are we in any way responsible for anything connected therewith. All responsibility rests with the Directors, as in every other regularly constituted Limited Liability Company. Fellows are, therefore, asked to recognize the Exhibition

as being absolutely distinct from the Society, being, in fact, an entirely separate and independent organization. The Council have, however, welcomed the proposal that such an International Exhibition should be held, and will render the Association every reasonable assistance in its power.

The Association, recognizing the importance of securing the great weight of horticultural interest vested in the Society, approached the Council with a view to establishing a suitable friendly working arrangement between the two bodies, and—

(*a*) The Royal Horticultural Society has agreed—

1. To contribute £1000 towards the expense of promoting the International Exhibition; and

2. To guarantee a further sum of £4000 against the contingency of there being an ultimate loss on the Exhibition.

(*b*) The Directors of the International Exhibition Association have agreed—

1. To give to all Fellows of the Society certain special and definite privileges over the General Public in regard to the purchase of tickets for the Exhibition; and

2. To allow all such tickets purchased by Fellows of the Society to be transferable.

A statement of the reduction on the charge for admission to be made to Fellows having been so recently issued in the last JOURNAL, it need not be repeated here.

19. **The use of F.R.H.S.**—Cases of misuse of the letters F.R.H.S. having recently been brought to the notice of the Council, a legal opinion has been obtained with a view to restricting their use in the future. One Fellow, in particular, having neglected to pay his annual subscription for a series of years, a special resolution of the Fellows assembled in General Meeting on November 21 declared his rights and privileges as a Fellow forfeited under Bye-law 24, and he thereupon ceased to be a Fellow, and consequently forfeited also his right to append to his name the letters F.R.H.S.

20. **Presents.**—Many gifts have been made to the Society during the year. Baron Bruno Schröder's munificent gift to the Library has already been mentioned, as have also the plants from Sir Frank Crisp, Mr. Bowles, and Mr. Marshall; 220 books for the library have been received under the bequest of the late Mr. Gumbleton; 150 volumes from the late Colonel Beddome's library, presented by his widow; a collection of dried specimens of British plants from Miss F. M. Hudson; a fine old steel engraving of Linnaeus from Mr. Christopher J. Sandberg; an original autograph engraving of William McNab of Edinburgh, from Mr. Chas. Ross, V.M.H., and two Silver Cups, one from Mr. A. L. Wigan as an annual prize for Roses at the Summer

	£	s.	d.	£	s.	d.
To ESTABLISHMENT EXPENSES—						
Ground Rent	690	0	0			
Rates and Taxes	479	9	1			
Water Rate	78	15	6			
Electric Light	216	19	3			
Gas	38	7	7			
Insurances	57	6	9			
				1,560	18	2
Salaries and Wages	1,787	16	0			
Printing and Stationery	1,218	18	9			
Postages	480	13	9			
Fuel	63	12	0			
Professional Fees	126	14	0			
Gratuities	13	2	0			
Repairs and Renewals (including £150 for Hall Painting)...	506	12	1			
Miscellaneous Expenses	157	3	9			
				4,354	12	4
,, JOURNAL, PRINTING AND POSTAGE ...				3,465	8	4
STAFF PENSION	472	9	2			
Less contributed by the Staff, as per scheme ...	199	3	1			
				273	6	1
SHOWS and MEETINGS—						
Temple Show	984	2	5			
Olympia Show	1,413	9	7			
Autumn Shows	375	5	6			
Labour, Floral Meetings and Conferences ...	191	11	9			
Expenses do. do. ...	170	3	1			
Council, Committee and Deputation Expenses	275	3	4			
Painting Orchid Certificates	33	15	0			
				3,443	10	8
,, PRIZES and MEDALS—						
Awarded at Society's Shows	470	10	1			
Awarded by Deputation at other Shows ...	25	7	6			
				495	17	7
,, WISLEY GARDENS—						
Rates, Taxes, and Insurances	77	14	5			
Superintendent's Salary	250	0	0			
Labour	1,129	7	1			
Garden Implements	158	1	10			
Loam and Manure	138	19	2			
Repairs	124	11	9			
Fuel	215	2	0			
Miscellaneous Expenses	156	9	3			
				2,250	5	6
,, COST of GROWING, PACKING, and DISTRIBUTION of PLANTS to FELLOWS				272	11	0
,, LABORATORY, WISLEY—						
Salaries	351	19	4			
Miscellaneous Expenses	112	5	9			
Prize Fund	5	12	11			
				469	18	0
,, CONTRIBUTION to LINDLEY LIBRARY (Purchase of Books)	822	9	2			
,, CONTRIBUTION to LINDLEY LIBRARY ...	156	19	8			
				979	8	10
,, COST OF NEW ROCK GARDEN, WISLEY ...				1,302	18	9
,, COST OF NEW ROAD TO DIRECTOR'S HOUSE, WISLEY				72	15	0
,, DEPRECIATION—						
Hall Glass Roof, Furniture, Glass Houses, Wisley, Plant and Materials				554	14	0
				19,946	4	3
,, BALANCE, carried to Balance Sheet				8,454	10	2
				£27,950	14	5

	£ s. d.	£ s. d.
By ANNUAL SUBSCRIPTIONS		17,965 12 0
„ ENTRANCE FEES		376 19 0
„ DIVIDENDS AND INTEREST	1,980 19 7	
„ Do. DAVIS TRUST	50 11 2	
		2,031 10 9
„ SHOWS AND MEETINGS—		
Temple Show	1,791 18 3	
Olympia Show	1,371 16 0	
Autumn Shows	14 12 0	
Takings at Hall Shows	270 5 6	
		3,448 11 9
„ JOURNALS AND OTHER PUBLICATIONS—		
Advertisements	715 12 6	
Sale of Publications	232 15 4	
		948 7 10
„ HALL LETTINGS	2,241 7 4	
Less Labour Expenses	232 8 9	
		2,008 18 7
„ PRIZES AND MEDALS		226 14 0
„ EXAMINATIONS IN HORTICULTURE—		
Amount received in Fees	195 0 0	
Less expended	138 0 0	
		57 0 0
„ WISLEY GARDENS—		
Produce sold	87 12 6	
Students' Fees	115 10 0	
Inspection of Gardens	178 18 0	
		382 0 6
„ EDUCATIONAL GRANT, WISLEY SCHOOL ...		400 0 0
„ LIFE COMPOSITIONS— Being amounts paid by Fellows now deceased		105 0 0
		£27,950 14 5

	£	s.	d.	£	s.	d.	£	s.	d.
To CAPITAL FUNDS ACCOUNT—									
As at December 31, 1910 ...	35,642	13	4						
Less Fees paid by Fellows now deceased	105	0	0						
				35,537	13	4			
LIFE COMPOSITIONS received since				463	1	0			
							36,000	14	4
,, SUNDRY CREDITORS							691	18	4
,, SUBSCRIPTIONS, &c., paid in advance							604	4	6
,, WISLEY SCHOLARSHIP—									
Balance December 31, 1910 ...	12	10	0						
Given by the Gardeners' Company	25	0	0						
				37	10	0			
Less paid to Scholars				18	15	0			
							18	15	0
,, RESERVE ACCOUNT—HALL PAINTING—									
Balance December 31, 1910 ...	300	0	0						
Added 1911	150	0	0						
				450	0	0			
Less expended 1911				376	6	8			
							73	13	4
,, DEPRECIATION AND RENEWALS RESERVE ACCOUNT—									
As at December 31, 1910				2,493	4	0			
Added 1911				554	14	0			
							3,047	18	0
,, WILLIAMS MEMORIAL FUND							29	10	11
,, MASTERS MEMORIAL FUND							7	7	3
,, NICHOLSON MEMORIAL FUND							33	12	6
,, LAWRENCE TESTIMONIAL FUND							127	0	5
,, SCHRÖDER PENSION							9	8	4
,, INTERNATIONAL EXHIBITION, 1912							300	0	0
,, GENERAL REVENUE ACCOUNT—									
Balance December 31, 1910				63,754	8	11			
Less Bad Debts				1	15	0			
				63,752	13	11			
,, REVENUE FOR THE YEAR, as per annexed Account				8,454	10	2			
							72,207	4	1
,, CONTINGENT LIABILITY—									
International Exhibition 1912, Amount Guaranteed				4,000	0	0			
							£113,151	7	0

	£ s. d.	£ s. d.	£ s. d.
By CAPITAL EXPENDITURE—			
„ NEW HALL AND OFFICES—			
As at December 31, 1910			40,950 11 2
„ FURNISHING HALL AND OFFICES—			
As at December 31, 1910		2,165 6 5	
Expenditure since (Card Cabinet)		16 16 0	
			2,182 2 5
„ DWELLING HOUSES, WISLEY—			
As at December 31, 1910 ...	4,125 13 6		
Expenditure since (Director's House and Bothy)	1,430 13 4		
		5,556 6 10	
„ GLASS HOUSES, RANGES, POTTING SHED, &c., WISLEY—			
As at December 31, 1910		4,560 14 6	
„ LABORATORY, WISLEY—			
As at December 31, 1910		1,627 14 11	
			11,744 16 3
N.B.—The Wisley Estates are, under the Trust Deed, vested in the Society only so long as it is in the position to use them as an Experimental Garden. The value of the expenditure thereon depends therefore on the continual user of the Garden by the Society.			
„ PLANT AND MATERIALS—			
Appliances for Shows		236 11 0	
Furniture and Fittings, Wisley, as at December 31, 1910 ...	165 6 0		
Expenditure since (Blinds, Director's House)	14 15 3		
		180 1 3	
Horse and Cart, Garden Plant, &c.		89 4 11	
Fencing and Wire Netting, Wisley		102 6 9	
Scientific Instruments and Fittings, Laboratory		175 6 5	
Breakable Apparatus, Laboratory		95 2 4	
			878 12 8
„ SUNDRY DEBTORS AND PAYMENTS MADE IN ADVANCE			1,147 6 6
„ INVESTMENT OF DEPRECIATION AND RENEWAL AND RESERVE ACCOUNT—			
3½ % India Stock, £2,562 6*s.* 5*d.* ... *cost*			2,493 4 0
(*The approximate value of these Investments on January* 1, 1912, *was* £2,402 3*s.* 7*d.*)			
„ INVESTMENTS as per Schedule			52,383 10 9
(*The approximate value of these Investments on January* 1, 1912, *was* £49,355 3*s.* 5*d.*)			
„ CASH—			
At Bank		834 3 8	
On Deposit		500 0 0	
In Hand		36 19 7	
			1,371 3 3
			£113,151 7 0

I have audited the books from which the foregoing Accounts are compiled, and certify that they exhibit a true and correct statement of the position of the Society on December 31, 1911.

ALFRED C. HARPER, F.C.A., *Auditor*
(HARPER BROTHERS AND FEATHER, *Chartered Accountants*),
10 Trinity Square, London, E.C.

January 11, 1912.

SCHEDULE OF INVESTMENTS.

December 31, 1911.

		£	s.	d.
$2\frac{1}{2}$ % Consols, £8,554 5*s.* 2*d.*	cost	8,162	16	0
3 % Local Loans, £5,800	„	6,006	16	6
$3\frac{1}{2}$ % Indian Rupee Paper, 37,000 Rupees	„	2,462	14	4
$3\frac{1}{2}$ % Dominion of Canada Registered Stock £2,000	„	2,000	0	0
4 % Canadian Pacific Railway Company Consolidated Debenture Stock, £4,632	„	4,999	14	1
$3\frac{1}{2}$ % London County Consolidated Stock, £3,000	„	3,020	13	6
4 % Great Eastern Railway Debenture Stock, £3,500	„	3,969	17	3
$3\frac{1}{2}$ % India Stock, £2,063 4*s.* 6*d.*	„	2,024	10	4
4 % Northern Pacific and Great Northern Railway Joint Bonds £5,000	„	5,056	6	0
4 % New York Central and Hudson River Railroad Company Gold Debentures £6,000	„	5,857	6	9
4 % Chicago, Milwaukee & St. Paul Railway Company 25 years, Gold Bonds £2,000	„	1,930	4	0
7 % Central Argentine Railway Preference Stock £1,800 ...	„	2,907	3	6
5 % Buenos Ayres Great Southern Railway £2,500	„	2,985	8	6
4 % Mortgage on Freehold	„	1,000	0	0
		£52,383	10	9

	£ s. d.	£ s. d.		£ s. d.	£ s. d.
To Amount of Fund, December 31, 1910	1,797 8 9		By Consols, £2,022 8 9 .. .. cost	1,797 8 9	
„ Dividends received		50 11 2	„ Revenue and Expenditure Account		50 11 2

WILLIAMS MEMORIAL FUND.

Raised by Donations in 1891 in Memory of B. S. Williams towards Prizes and Medals.

	£ s. d.	£ s. d.		£ s. d.	£ s. d.
To Amount of Fund, December 31, 1910	168 0 0		By East India Railway Annuity Class B £7	168 0 0	
„ Balance December 31, 1910		23 1 8			
„ Dividends received		6 9 3	„ Balance in hands of R. H. Society		29 10 11
		29 10 11			29 10 11

MASTERS MEMORIAL FUND.

Raised by Donations in 1908 in Memory of Dr. Masters towards the Provision of one or more Annual Lectures.

	£ s. d.	£ s. d.		£ s. d.	£ s. d.
To Amount of Fund, December 31, 1910	290 13 6		By Midland Railway Preference Stock £400	290 13 6	
„ Balance December 31, 1910		7 7 3	„ Mr. G. F. Scott Elliot, for Lectures, 1911		10 0 0
„ Dividends received		10 0 0	„ Balance in hands of R. H. Society		7 7 3
		17 7 3			17 7 3

LINDLEY LIBRARY TRUST.

	£ s. d.	£ s. d.		£ s. d.	£ s. d.
To Amount of Fund, December 31, 1910	1,516 0 0		By Lancashire and Yorkshire Railway 3 per cent. Preference Stock £1,458 15s. 7d. held by the Charity Commissioners	1,516 0 0	
„ Amount added in 1911— Valuation of Library as estimated by Messrs. Wesley & Son, December 31, 1910 £2,000 0 0			„ Valuation of Library as estimated by Messrs. Wesley & Son, December 31, 1910	2,000 0 0	
„ Contribution from R. H. Society 822 9 2	2,822 9 2		„ Purchase of Books, 1911	822 9 2	
	4,338 9 2			4,338 9 2	
„ Balance December 31, 1910		17 4 1	„ Expenses compiling new Catalogue		94 5 6
„ Dividends and Donations received		47 1 0	„ „ (including Secretary's Salary)		126 19 3
„ Contribution from R. H. Society		156 19 8			
		221 4 9			221 4 9

NICHOLSON MEMORIAL FUND.

Raised by Donations in 1908 in Memory of George Nicholson for Prizes to Wisley Students.

	£ s. d.		£ s. d.
To Amount of Fund December 31, 1910	33 12 6	By Balance in hands of R. H. Society	33 12 6

SCHRÖDER PENSION.

Provided by Royal Horticultural Society in Memory of the late Baron Schröder to pay to Gardeners' Royal Benevolent Institution for one pension.

	£ s. d.	£ s. d.		£ s. d.	£ s. d.
To Amount of Fund, December 31, 1910	537 14 6		By Great Western Railway 4 per cent. Debenture Stock £500	557 14 6	
„ Balance, December 31, 1910		9 8 4	„ Gardeners' Royal Benevolent Institution		20 0 0
„ Dividends received		20 0 0	„ Balance in hands of R. H. Society		9 8 4
		29 8 4			29 8 4

Show, the other for Alpines, presented by Mr. Reginald Farrer. The Council take this opportunity of expressing their cordial thanks to the donors.

21. **Victoria Medal of Honour.**—The year was almost spent, and the Council were rejoicing in not having any vacancy to report in the ranks of the Victoria Medal of Honour, when almost simultaneously it became necessary to record the loss of two of the most prominent of the recipients of this distinction. Sir Joseph D. Hooker, O.M., G.C.S.I., C.B., F.R.S.—the foremost of English botanists in the 19th century—passed away in December after an unusually long life of useful and active scientific work. Sir Joseph was pre-deceased by only a few days by Mr. James Douglas, one of the greatest practical gardeners and florists of this country, and one who for many years has worked whole-heartedly on the Council of the Society and on Committees, and as a judge and an examiner. Sir Joseph Hooker had for more than half a century been Chairman of our Scientific Committee, and only four years ago, writing to the President to thank him for the Society's congratulations on his ninetieth birthday, he said:—"It has been a source of great regret to me that I am obliged to abandon all hope of attending the Society's meetings. As a botanist I have thereby lost much, for the Royal Horticultural Society has contributed more to botanical science as represented by collections, publications and experimental research, than any other establishment in Europe." The President and Council desire to put on record the very high esteem in which they have always held both of these Victorian medallists—the one so distinguished in science, the other in the practical work of the application of science.

22. **Obituary.**—Among many other friends whose names will no longer be seen on our list are the Right Hon. Sir Chas. Dilke, Bart., a Director of the "Gardeners' Chronicle"; Colonel R. H. Beddome, a past Member of the Council; The Dowager Duchess of Wellington; Earl Spencer, K.G.; The Earl of Onslow, G.C.M.G.; The Earl of Cranbrook; Colonel Arthur Collins, C.B., M.V.O.; Sir William Grantham, K.C., to whom the Society owes much in connexion with the Temple Show; Sir Francis Galton, F.R.S.; Sir John Aird, Bart.; Sir William Farrer; Lady Joicey; Messrs. C. Foster, Geo. Hobday and James Walker—Members of the Society's Committees; and Messrs. G. R. M. Murray, F.R.S., late Keeper of Botany, British Museum; Henry Bohn, W. E. Gumbleton, John Robson, H. F. Tiarks, A. W. Weeks, and L. A. de Graaf (of Leiden). Their loss to the Society is much regretted, but their influence will long remain in the Society's active life.

23. **Annual Progress.**—The following table will show the Society's progress in regard to numerical strength during the past year:

Loss by Death in 1911.

		£	s.	d.
Hon. Fellows	3	0	0	0
Life ,,	25	0	0	0
4 Guineas	1	4	4	0
2 ,,	64	134	8	0
1 Guinea	78	81	18	0
	171	£220	10	0

Loss by Resignation, &c.

		£	s.	d.
4 Guineas	0	0	0	0
2 ,,	177	371	14	0
1 Guinea	374	392	14	0
Associates	30	15	15	0
Affiliated Societies	17	17	17	0
	598	£798	0	0
Total Loss	769	£1,018	10	0

Fellows Elected in 1911.

		£	s.	d.
Hon. Fellows	7	0	0	0
4 Guineas	9	37	16	0
2 ,,	702	1,474	4	0
1 Guinea	735	771	15	0
Associates	50	26	5	0
Affiliated Societies	43	45	3	0
Commutations 19 £463 1s. 0d.				
	1,565	£2,355	3	0
Deduct Loss		1,018	10	0
Net Increase in Income		£1,336	13	0

New Fellows, &c.	1,565
Deaths and Resignations	769
Numerical Increase	796
Total on December 31, 1910	12,043
Total on December 31, 1911	12,839

24. **Committees, &c.**—The Society owes a constantly recurring debt to the Members of the Standing and Special Committees, Chairmen, Judges, Writers of Papers for the Journal, Compilers of Extracts, Reviewers, Lecturers, and the several Examiners, who during the past twelve months have done so much to contribute to the Society's usefulness, and to help maintain its high standing among the practical and scientific institutions of the world.

The Council also acknowledge their obligations to the Press for their invaluable assistance in reporting upon, and calling attention to, the work of the Society.

By Order of the Council,
W. WILKS, *Secretary.*

Royal Horticultural Society,
Vincent Square, Westminster, S.W.
January 1, 1912.

GENERAL MEETING.

February 20, 1912.

Mr. W. A. Bilney, J.P., in the Chair.

Fellows elected (39).—Mrs. Barten W. Allen, A. Anderson, C. E. Bartholomew, C. A. Bayford, F. C. Bayliss, G. A. Beazley, Miss E. Blacklock, Mrs. A. Bogle, Miss Bois, A. C. Bonner, Dowager Lady Broadbent, R. Brough, W. P. Burra, E. Butz, P. Cane, Miss Chichester, Mrs. H. B. Clarke, Mrs. A. M. A. Duneher, Mrs. W. H. Evans, Mrs. W. Goldschmidt, Mrs. Loy, S. Lacey, Mrs. A. D. Mackinnon, Miss L. A. Money, W. C. Parsons, F. J. Perks, Mrs. A. R. Poole, Dr. C. Renner, Mrs. Mortimer Rooke, Miss J. H. Severn, Mrs. E. L. Shute, Hon. Mrs. Skeffington-Smyth, Mrs. E. J. Thatcher,

Miss E. Wanklyn, G. Stafford Ward, F. J. Watkins, W. Winans, G. E. Wood, Mrs. A. W. Yeo.

Fellows resident abroad (3).—W. F. C. Asimont (B. N. Borneo), W. A. Talbot (Switzerland).

A lecture on "New Sweet Peas" was given by Mr. Wm. Cuthbertson, J.P. (see p. 10).

GENERAL MEETING.

March 5, 1912.

Mr. A. D. Hall, M.A., F.R.S., in the Chair.

Fellows elected (76).—G. S. Affleck, T. E. Allwood, Mrs. R. H. Anderson, Mrs. W. Arnold, Miss Berryman, Mrs. Blencowe, R. R. Blewett, C. J. Blunn, Miss E. Bonsor, P. C. Brachi, R. Burley, Miss M. E. Burton, Lady G. Caillard, Mrs. T. Chamberlain, E. K. Chambers, C.B., E. H. Chitty, Mrs. S. A. Coats, Mrs. A. Cooper, Miss Crosthwaite, Mrs. J. H. Cundell, Lady A. Daniell, J. R. Darnell, Mrs. H. Davis, Miss A. Dawnay, Rev. F. H. Deane, A. M. Downton, J. L. Edginton, C. W. Edelsten, Miss I. D. Edmiston, Mrs. I. Edwards, Mrs. Eickhoff, W. Eickhoff, V. F. Engleheart, Mrs. Farish, Mrs. Ferguson-Davie, H. L. Foster, J. Friend, Mrs. W. Green-Price, R. C. Harding, Miss Hickman, Mrs. R. Hutchison, Mrs. Jameson, Mrs. B. E. Johnson, Mrs. W. Hope Johnstone, J. Kidd, Mrs. W. H. Langton, Lady Leconfield, A. Leith, J. D. Maitland, A. Meyer, C. D. Morton, Mrs. Murdoch, J. H. Paddon, J. C. Peal, Captain R. S. Pearson, Miss Pennington, F. W. Percival, H. E. Purser, Countess of Ranfurly, Mrs. R. Reid, A. Robertson, Miss A. Russell, G. Scragg, W. Simmons, Mrs. F. Stewart, E. M. Stone, Mrs. A. Stoneham, J. Taylor, Miss Thurburn, Mrs. Tilling, Rev. S. H. Turner, J. C. Wallace, Mrs. E. H. Wellby, Mrs. Western, J. E. Williams, R. J. Williams.

Fellow resident abroad (1).—P. C. Dempsey (Trenton, Ontario).

Associates (5).—Miss C. Holmes, Miss P. Jones, Miss E. M. McKerrow, Miss A. Mayo, Miss E. Thornton.

Societies affiliated (2).—Cobham Flower Show, Wallington Amateur Gardeners' Association.

A lecture on "The Stimulation of Plant Growth" was given by Professor H. E. Armstrong, F.R.S., LL.D. (see p. 17).

SHOW OF SPRING BULBS.

Tuesday and Wednesday, March 5 and 6.

Hyacinths, Tulips, and Daffodils.

The Council offered (subject to the General Rules of the Society) the following Prizes, presented to them by the General Bulb Growers' Society at Haarlem:—

Division I.—For Amateurs.

Class 3.—18 Hyacinths, distinct.

First Prize, £6 6*s.*; Second, £5 5*s.*; Third, £4 4*s.*; Fourth, £3 3*s.*; Fifth, £2 2*s.*; Sixth, £1 1*s.*

1. Duke of Portland, Welbeck Abbey, Worksop (gr. J. Gibson).
2. F. R. Dixon-Nuttall, Esq., Ingleholme, Eccleston Park, Prescot (gr. J. W. Barker).
3. Lord Howard de Walden, Audley End, Saffron Walden (gr. J. Vert).
4. W. W. Bourne, Esq., Garston Manor, Watford (gr. G. Dyke).
5. H. S. Bartleet, Esq., Severndroog, Shooters Hill (gr. H. Agate).
6. The Hon. Whitelaw Reid, Wrest Park, Ampthill, Beds. (gr. G. Mackinlay).

Class 4.—12 Hyacinths, distinct.

First Prize, £5 5*s.*; Second, £4 4*s.*; Third, £3 3*s.*; Fourth, £2 2*s.*; Fifth, £1 1*s.*

1. A. Hanson, Esq., Ivanhoe, Victoria Park, Wavertree, Liverpool.
2. Marquis of Salisbury, Hatfield House, Hatfield, Herts. (gr. H. Prime).
3. Lord Hillingdon, Wildernesse, Sevenoaks (gr. J. Shelton).
4. Miss C. A. Michell, Oakfield, Cricklewood, N.W.
5. Lady Yate, Park Hill, Streatham Common, S.W. (gr. W. Howe).

Class 5.—6 Hyacinths, distinct.

First Prize, £2 2*s.*; Second, £1 10*s.*; Third, £1 1*s.*; Fourth, 10*s.*

1. R. Morrison, Esq., Prince Alfred Road, Wavertree, Liverpool.
2. C. E. S. Bishop, Esq., Norton Priory, Chichester, Sussex (gr. H. Edwards).
3. Earl of Lytton, Knebworth, Herts (gr. H. Brotherston).
4. C. B. Gabriel, Esq., Easdale, Horsell, Surrey.

Class 6.—4 pans containing Hyacinths, 10 roots of one variety in each pan. The blooms of each pan to be of distinctly different colour from those of the other three pans. The bulbs need not have been actually grown in the pans they are shown in.

First Prize, £4 4*s.*; Second, £3 3*s.*; Third, £2 2*s.*; Fourth, £1 1*s.*

1. Duke of Portland.
2. Marquis of Salisbury.
3. The Hon. Whitelaw Reid.
4. No award.

Division II.—For Trade Growers.

Class 7.—Collection of 100 Hyacinths, in 20 named varieties, 5 blooms of each variety, grown in pots or glasses.

Prize, the Gold Medal of the General Bulb Growers' Society of Haarlem.

1. Messrs. Cuthbert, Southgate Nurseries, Middlesex.

Class 8.—Collection of 120 Hyacinths, in 12 varieties in pans, 10 roots of one variety in each pan. The bulbs need not have been actually grown in the pans they are shown in.

Prize, the Gold Medal of the General Bulb Growers' Society of Haarlem.

1. Messrs. Cuthbert.

Bulbs Grown in Moss Fibre, &c.

Subject to the General Rules of the Society the Council also offered the following Prizes presented to them by Mr. Robert Sydenham:—

Classes 9-11.—*Bulbs grown in moss fibre or similar material (not earth), and without drainage.*

Amateurs.

Class 9.—Six single Hyacinths, in separate vases, not exceeding 6 inches in diameter, to be selected from any one of the following varieties: 'Enchantress,' 'General de Wet,' 'Innocence,' 'Jacques,' 'Johan,' 'King Alfred,' 'King of the Blues,' 'Koh-i-Noor,' 'Lady Derby,' 'Ornament Rose,' 'Princess May,' 'Roi des Belges,' 'Rose à Merveille,' 'Schotel.'

Prizes, 21*s.*, 17*s.* 6*d.*, 15*s.*, 10*s.* 6*d.*, 7*s.* 6*d.*

1. Miss E. M. Rawlins, Great Houghton Hall, Northampton.
2. Lady Yate.
3. Miss C. A. Michell.
4. Hon. Mrs. Guy Baring, 9 Chesterfield Street, Berkeley Square, W.
5. Miss M. Gordon Thompson, The Elms, Potters Bar.

Class 10.—Six vases of Tulips (vases not exceeding 7 inches in diameter), no restriction as to the number of bulbs in a vase, to be selected from the following: 'Duchesse de Parma,' 'Fabiola,' 'Joost van Vondel,' 'Keizerskroon,' 'Le Rêve,' 'Mon Trésor,' 'Prince of Austria,' 'Queen of the Netherlands,' 'Rose Luisante,' 'Van der Neer,' 'Vermilion Brilliant,' 'White Joost van Vondel.'

Prizes, 21*s.*, 17*s.* 6*d.*, 15*s.*, 10*s.* 6*d.*, 7*s.* 6*d.*

1. Lady Yate.
2. Hon. Mrs. Guy Baring.

Class 11.—Six vases of Narcissi (vases not exceeding 7 inches in diameter), no restriction as to the number of bulbs in a vase, to be selected from the following: 'Albatross,' 'Blood Orange,' 'Bullfinch,' 'C. J. Backhouse,' 'Dairymaid,' 'Early Easter,' 'Emperor,' 'Glitter,' 'Horace,' 'Leonie,' 'Lilian,' 'Lucifer,' 'Lulworth,'

'Madame de Graaff,' 'Red Coat,' 'Red Flag,' 'Shooting Star,' 'Victoria,' 'White Lady.'

Prizes, 21*s*., 17*s*. 6*d*., 15*s*., 10*s*. 6*d*., 7*s*. 6*d*.

1. Miss C. A. Michell.
2. Lady Yate.
3. Miss E. M. Rawlins.
4. Hon. Mrs. Guy Baring.

GENERAL MEETING.

March 19, 1912.

Mr. W. A. Bilney, J.P., in the Chair.

Fellows elected (86).—W. H. Ames, Mrs. Bailey, V. Banks, Miss H. M. Bathe, Countess Benckendorff, Mrs. W. Bennett, A. H. Brodribb, Mrs. E. A. Cameron, F. Carlisle, Mrs. Castellain, Miss A. J. Champion, A. E. Cripps, Mrs. A. E. Cripps, P. R. Croft, Mrs. A. G. Crosse, Miss E. A. Cumberland, P. Daniels, W. K. D'Arcy, Mrs. Darell-Brown, Mrs. H. de Zoete, Hon. Lady Grey Egerton, B. A. Elton, Miss E. L. Elyard, Lady Fairbairn, Mrs. Geiger, Mrs. W. Gibbons, H. W. Gilbey, Rev. H. J. Gladstone, W. G. Glennie, Mrs. F. S. Goulding, W. M. Graham, Mrs. J. Gunter, Mrs. T. Hale, G. W. Hannaford, Mrs. E. M. Harvey, Miss A. Heath, Mrs. C. Hill, Mrs. P. Howes, S. Humphries, Sir Philip Hutchins, K.C.S.I., W. Kemsley, Miss Kidston, Captain R. Kilbee-Stuart, Mrs. Laidlay, Major E. M. Lang, Lady Lawson, Mrs. C. Lee, Mrs. Litchfield, Dowager Lady Lockhart-Ross, T. Lucas, D. McArthur, I. McHardy, W. H. McKewan, E. M. May, G. Neilson, Mrs. G. Neilson, Mrs. E. H. Peach, E. W. Pearson, Mrs. S. E. Pedley, Mrs. R. Pelly, Mrs. W. G. Raphael, Mrs. Schwind, Mrs. C. Scott-Chad, A. Smart, C. S. Smith, Mrs. T. Smith, E. S. Shepherd, Mrs. Stansfeld, Miss M. Strickland, Mrs. Swan, J. L. Sweet, L. Taylor, E. R. Testar, A. Thompson, Colonel B. T. L. Thomson, Mrs. M. Tomlin, Mrs. Turner, G. Veitch, H. M. Wakley, F.R.I.B.A., F. Walker, S. Walker-Lockwood, C. Watts, A. Wertheim, Mrs. M. E. Wilkinson, Miss G. Wilks, J. R. Williams.

Fellows resident abroad (3).—W. B. Harris, F.R.G.S. (Morocco), Mrs. A. S. Henderson (N.Z.), G. G. Paton (U.S.A.).

Associate (1).—D. Barnard.

Society affiliated (1).—Sevenoaks Gardeners' Society.

A lecture on "Ferns" was given by Mr. H. B. May, V.M.H. (see p. 22).

GENERAL MEETING.

April 2, 1912.

Sir John T. D. Llewelyn, Bart., in the Chair.

Fellows elected (67).—L. P. Andrews, W. Balchin, Mrs. Ballance, Mrs. G. Barnett, Mrs. P. Barry, Mrs. E. Ascheton Bennett, Miss E.

Billington, Mrs. Bingley, Mrs. V. Blagden, Miss B. Bonnell, Mrs. F. Burt, Dr. A. Cæsar, H. J. Caines, Miss N. Carew, Miss D. M. Carr, Mrs. H. W. Cassels, A. Cheal, Miss E. E. Clark, A. S. Cochrane, Mrs. L. Coward, the Countess of Crawford, A. E. Cumberbatch, Hon. Florence Daly, R. Daun, the Director of the John Innes Horticultural Institute, G. I. Dodson, Mrs. D. Faber, Mrs. Fisher, R. O. Fordham, Mrs. A. G. Frost, Miss Gib, Marshall Green, E. G. Gibson, Mrs. L. Griffiths, Miss M. K. Grimes, Mrs. C. C. Henry, G. K. Hext, F. F. Higginson, Mrs. T. J. Horder, G. H. Lees, G. Levitt, the Marchioness of Linlithgow, Major J. MacGillycuddy, D.L., Mrs. Meddings, Mrs. Mills, C. Moore, C. H. Mortimer, Lady Neville, Miss Pennant, Mrs. Philips, Mrs. E. Pilkington, Mrs. Powys-Lybbe, Mrs. Radcliffe, Mrs. J. F. Roberts, Hon. Bernard F. Rolls, Miss M. Stevens, Rev. A. B. Stevenson, F. J. Strover, Mrs. H. Cavalier Smith, G. M. Taylor, A. J. Thatcher, Carmichael Thomas, Mrs. Wynne Thomas, W. J. Wilson, Mrs. Withington, Mrs. Wrentmore, W. E. Wright.

Fellow resident abroad (1).—Anand B. Lal (Lucknow).

Society affiliated (1).—Alsager Gardeners' Society.

A lecture on "Tender Plants for a Warm Corner" was given by Mr. R. Irwin Lynch, V.M.H.

GENERAL MEETING.

April 16, 1912.

Dr. A. B. Rendle, F.R.S., in the Chair.

Fellows elected (61).—Mrs. W. M. Baker, Mrs. B. B. Batten, Mrs. Battye, R. C. Blundell, Mrs. Brown, Mrs. P. Bruce, Miss J. M. Burnham, Mrs. J. E. Capper, Miss Cochrane, E. H. Cox, Mrs. G. Cran, Mrs. W. H. S. Cutler, Mrs. A. C. Davidson, R. E. D'Esterre, Dowager Baroness de Ville, E. Dickson, F.G.S., E. A. Duffy, Mrs. F. A. Falkner, Miss M. H. Fergussen, W. Forbes-Leslie, H. C. Goddard, Miss W. N. Gould, G. C. A. Hasloch, Mrs. Hensman, S. Heywood, Mrs. C. E. Higginbotham, Mrs. Hill-Walker, H. J. W. Holt, E. Hulton, Mrs. J. H. Ingleby, Mrs. W. Jenkins, Dr. J. Johnston, J. J. Joicey, T. A. Jones, H. M. Knight, R. W. Lesser, Lady Lethbridge, Lady Lloyd, C. W. Low, A. N. McCarthy, Mrs. A. Macmillan, W. J. Maddocks, Mrs. R. H. Mitchell, Miss Moore, Mrs. Goodwin Newton, Mrs. A. R. Parker, W. T. Patrick, Mrs. W. H. Pease, A. C. Phillips, F. Phillips, H. V. Phillips, Mrs. G. W. T. Prowse, C. Quinton, W. Rolling, Miss F. Seton, A. C. Smart, Miss Sykes, F. E. Thompson, H. H. W. Turner, Mrs. S. Walker, Hon. Sir Arthur Walsh, K.C.V.O.

Fellows resident abroad (8).—S. Adhikary (India), W. J. Allen (N.S.W.), H. Desfossé (France), A. Holle (Holland), S. James (Canada), L. Macdonald (Victoria), J. C. Roy (India), E. T. Wheadon (Guernsey).

Associates (2).—Miss E. H. Ekins, Miss L. K. Herring.

Society affiliated (1).—Headley Horticultural Association.

A lecture on "Darwin as Ecologist" was given by the Rev. Professor G. Henslow, V.M.H. (see p. 27).

SHOW OF DAFFODILS.

TUESDAY AND WEDNESDAY, APRIL 16 AND 17.

Section I.—Open Classes.

(Exhibitors in Section I. could not compete in Sections II. and III.)

Class 1.—Collection of Daffodils, 48 varieties, distinct, fairly representing the different Divisions. Three stems of each.

First Prize, Gold Medal or Silver Cup; Second, Silver-Gilt Flora Medal; Third, Silver Flora Medal.

1. C. Bourne, Esq., Old Wharfe House, Simpson, Bletchley.
2. No award.
3. No award.

Class 2.—Twelve long Trumpet Daffodils, distinct varieties. (Division I.) Three stems of each.

First Prize, Silver-Gilt Flora Medal and £1; Second, £1; Third, 10*s*.

1. J. Mallender, Esq., Scrooby, Bawtry, Yorks.
2. No award.
3. No award.

Class 3.—Twelve Incomparabilis Daffodils, distinct varieties. (Division II.) Three stems of each.

First Prize, Silver-Gilt Flora Medal and £1; Second, £1; Third, 10*s*.

1. No award.
2. J. Mallender, Esq.
3. No award.

Class 4.—Twelve Barrii Daffodils, distinct varieties. (Division III.) Three stems of each.

First Prize, Silver-Gilt Flora Medal and £1; Second, £1; Third, 10*s*.

1. F. H. Chapman, Esq., Rotherside, Rye, Sussex.
2. C. Bourne, Esq.
3. No award.

Class 5.—Twelve Leedsii Daffodils, distinct varieties. (Division IV.) Three stems of each.

First Prize, Silver-Gilt Flora Medal and £1; Second, £1; Third, 10*s*.

1. J. Mallender, Esq.
2. No award.
3. No award.

Class 6.—Nine Poeticus Daffodils, distinct varieties. (Division IX.) Three stems of each.

First Prize, Silver-Gilt Flora Medal and £1; Second, £1; Third, 10*s*.

1. F. H. Chapman, Esq.
2. C. Bourne, Esq.
3. No award.

Class 7.—Nine Daffodils, distinct varieties, selected from Divisions V., VI., and VII. Three stems of each.

First Prize, £1; Second, 15*s.*; Third, 10*s.*

No entry.

Class 8.—Nine Polyanthus (Tazetta) Daffodils, including Poetaz varieties; distinct. (Division VIII.) Three stems of each.

First Prize, 10*s.*; Second, 7*s.* 6*d.*; Third, 5*s.*

No entry.

Class 9.—Six Double Daffodils, distinct varieties. (Division X.) Three stems of each.

First Prize, 10*s.*; Second, 7*s.* 6*d.*; Third, 5*s.*

No entry.

Section II.—Amateurs only.

All Flowers in this Section must be in Commerce.

(Exhibitors in Section II. could not compete in Sections I. and III.)

Class 10.—Collection of Daffodils, 24 varieties distinct, fairly representing the different Divisions. Three stems of each.

First Prize, Silver Cup and £1; Second, Silver-Gilt Flora Medal and 15*s.*; Third, Silver Banksian Medal and 10*s.*

1. Rev. T. Buncombe, The Rectory, Black Torrington, North Devon.
2. H. R. Darlington, Esq., Park House, Potter's Bar.
3. No award.

Class 11.—Six long Trumpet Daffodils, distinct varieties. (Division I.) Three stems of each.

First Prize, 15*s.*; Second, 10*s.*; Third, 7*s.* 6*d.*

1. Rev. T. Buncombe.
2. H. R. Darlington, Esq.
3. Duke of Rutland, Belvoir Castle, Grantham (gr. W. H. Divers).

Class 12.—Six Incomparabilis Daffodils, distinct varieties. (Division II.) Three stems of each.

First Prize, 15*s.*; Second, 10*s.*; Third, 7*s.* 6*d.*

1. Rev. T. Buncombe.
2. H. R. Darlington, Esq.
3. Duke of Rutland.

Class 13.—Six Barrii Daffodils, distinct varieties. (Division III.) Three stems of each.

First Prize, 15*s.*; Second, 10*s.*; Third, 7*s.* 6*d.*

1. Rev. T. Buncombe.
2. H. R. Darlington, Esq.
3. No award.

Class 14.—Six Leedsii Daffodils, distinct varieties. (Division IV.) Three stems of each.

First Prize, 15*s.*; Second, 10*s.*; Third, 7*s.* 6*d.*

1. H. R. Darlington, Esq.
2. Rev. T. Buncombe.
3. Duke of Rutland.

Class 15.—Six Poeticus Daffodils, distinct varieties. (Division IX.) Three stems of each.

First Prize, 15*s.*; Second, 10*s.*; Third, 7*s.* 6*d.*

1. H. R. Darlington, Esq.
2. No award.
3. No award.

Class 16.—Six Hybrid Triandrus Daffodils, distinct varieties. (Division V.) One stem of each.

First Prize, 15*s.*; Second, 10*s.*; Third, 7*s.* 6*d.*

No entry.

Class 17.—Six Polyanthus (Tazetta) Daffodils, including Poetaz varieties; distinct. (Division VIII.) Three stems of each.

First Prize, 10*s.*; Second, 7*s.* 6*d.*; Third, 5*s.*

No entry.

Class 18.—Three Double Daffodils, distinct varieties. (Division X.) Three stems of each.

First Prize, 7*s.* 6*d.*; Second, 5*s.*; Third, 3*s.*

1. H. R. Darlington, Esq.
2. Duke of Rutland.
3. No award.

Section III.—Amateurs only.

All Flowers in this Section must be in Commerce.

(Exhibitors in Section III. may not compete in Sections I. and II.)

Class 19.—Twelve Daffodils, distinct varieties, fairly representing the different Divisions. Three stems of each.

First Prize, Silver-Gilt Banksian Medal and 10*s.* 6*d.*; Second, Silver Flora Medal and 7*s.* 6*d.*; Third, Silver Banksian Medal and 5*s.*

1. W. B. Cranfield, Esq., East Lodge, Enfield Chase, Middlesex.
2. G. F. H. Banks, Esq., Crouchmore, Crawley, Sussex.
3. No award.

Class 20.—Three Trumpet Daffodils, distinct varieties. (Division I.*a.*) Three stems of each.

First Prize, 7*s.* 6*d.*; Second, 5*s.*; Third, 3*s.*

1. R. Morton, Grange Dene, Woodside Park, N.
2. G. Stocks, 44 Bentley Road, Doncaster.
3. No award.

Class 21.—Three Trumpet Daffodils, distinct varieties. (Division I.*b*.) Three stems of each.

First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 3*s*.

No award.

Class 22.—Three Trumpet Daffodils, distinct varieties. (Division I.*c*.) Three stems of each.

First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 3*s*.

1. W. B. Cranfield, Esq.
2. G. Stocks, Esq.
3. R. Morton, Esq.

Class 23.—Three Incomparabilis Daffodils, distinct varieties. (Division II.*a*.) Three stems of each.

First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 3*s*.

1. W. B. Cranfield, Esq.
2. R. Morton, Esq.
3. No award.

Class 24.—Three Incomparabilis Daffodils, distinct varieties. (Division II.*b*.) Three stems of each.

First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 3*s*.

1. R. Morton, Esq.
2. W. B. Cranfield, Esq.
3. No award.

Class 25.—Three Barrii Daffodils, distinct varieties. (Division III.*a*.) Three stems of each.

First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 3*s*.

1. W. B. Cranfield, Esq.
2. R. Morton, Esq.
3. No award.

Class 26.—Three Barrii Daffodils, distinct varieties. (Division III.*b*.) Three stems of each.

First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 3*s*.

1. R. Morton, Esq.
2. G. Stocks, Esq.
3. No award.

Class 27.—Three Leedsii Daffodils, distinct varieties. (Division IV.) Three stems of each.

First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 3*s*.

1. R. Morton, Esq.
2. W. B. Cranfield, Esq.
3. No award.

Class 28.—Three Hybrid Triandrus Daffodils, distinct. (Division V.) One stem of each.

First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 3*s*.

No entry.

Class 29.—Three Polyanthus (Tazetta) Daffodils, including Poetaz varieties; distinct. (Division VIII.) Three stems of each.

First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 3*s*.

No award.

Class 30.—Three Poeticus Daffodils, distinct varieties. (Division IX.) Three stems of each.

First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 3*s*.

1. W. B. Cranfield, Esq.
2. G. F. H. Banks, Esq. / R. Morton, Esq. } Equal.

Class 31.—Three Double Daffodils, distinct varieties. (Division X.) Three stems of each.

First Prize, 7*s*. 6*d*.; Second, 5*s*.; Third, 3*s*.

1. No Award.
2. R. Morton, Esq.
3. No award.

Section IV. Seedling and New Daffodils—Open Classes.

Class 32.—Twelve Daffodils, distinct varieties, introduced into commerce during or since 1907. One stem of each.

First Prize, Silver Cup; Second, Silver-gilt Flora Medal and 15*s*.; Third, Silver Flora Medal and 10*s*.

1. C. Bourne, Esq.
2. No award.
3. No award.

Class 33.—Twelve Daffodils, distinct varieties, not in commerce. One stem of each.

First Prize, Gold Medal; Second, Silver-gilt Flora Medal and £1; Third, Silver Flora Medal and 15*s*.

1. E. M. Crosfield, Esq., Cossington House, Bridgwater.
2. F. H. Chapman, Esq.
3. J. Mallender, Esq.

Class 34.—Six Daffodils, distinct varieties, not in commerce. One stem of each.

First Prize, Silver-gilt Banksian Medal and £1; Second, Silver Flora Medal and 15*s*.; Third, Silver Banksian Medal and 10*s*.

1. No award.
2. Duke of Rutland.
3. No award.

Class 35.—Three Daffodils, distinct varieties, not in commerce. One stem of each.

First Prize, Silver Flora Medal and 10*s*.; Second, Silver Banksian Medal and 7*s*. 6*d*.; Third, 7*s*. 6*d*.

1. C. Bourne, Esq.
2. W. B. Cranfield, Esq.
3. Rev. T. Buncombe.

Class 36.—Six Seedling Daffodils, distinct, not in commerce, raised by the exhibitor. One stem of each.

First Prize, Silver Cup; Second, Silver-gilt Flora Medal; Third, Silver Flora Medal.

1. E. M. Crosfield, Esq.
2. Messrs. Krelage, Bloemhof, Haarlem, Holland.
3. F. H. Chapman, Esq.

Class 37.—Three Seedling Daffodils, distinct, not in commerce, raised by the exhibitor. One stem of each.

First Prize, Silver-gilt Flora Medal; Second, Silver Flora Medal; Third, Silver Banksian Medal.

1. A. M. Wilson, Esq., Shovell, North Netherton, Bridgwater.
2. P. D. Williams, Esq., Lanarth, St. Keverne, Cornwall.
3. C. H. Cave, Esq., Rodway Hill House, Mangotsfield.

Class 38.—One Trumpet Daffodil (Division I.), not in commerce. One stem.

First Prize, 10*s*. 6*d*.; Second, 7*s*. 6*d*.; Third, 5*s*.

1. Messrs. Krelage.
2. C. Bourne, Esq.
3. W. Welchman, Esq., Birdbeck House, Upwell, Wisbech.

Class 39.—One Incomparabilis Daffodil (Division II.), not in commerce. One stem.

First Prize, 10*s*. 6*d*.; Second, 7*s*. 6*d*.; Third, 5*s*.

1. No award.
2. C. H. Cave, Esq.
3. Rev. T. Buncombe.

Class 40.—One Barrii Daffodil (Division III.), not in commerce. One stem.

First Prize, 10*s*. 6*d*.; Second, 7*s*. 6*d*.; Third, 5*s*.

1. C. Bourne, Esq.
2. P. D. Williams, Esq.
3. W. Welchman, Esq.

Class 41.—One Leedsii Daffodil (Division IV.), not in commerce. One stem.

First Prize, 10*s*. 6*d*.; Second, 7*s*. 6*d*.; Third, 5*s*.

1. W. B. Cranfield, Esq.
2. C. H. Cave, Esq.
3. J. Mallender, Esq.

Class 42.—One Hybrid Triandrus Daffodil (Division V.), not in commerce. One stem.

First Prize, 10*s*. 6*d*.; Second, 7*s*. 6*d*.; Third, 5*s*.

1. W. B. Cranfield, Esq.
2. P. D. Williams, Esq.
3. F. H. Chapman, Esq.

Class 42a.—One Hybrid Jonquilla Daffodil (Division VII.), not in commerce. One stem.

First Prize, 10*s.* 6*d.*; Second, 7*s.* 6*d.*; Third, 5*s.*

No entry.

Class 43.—One Poetaz Daffodil (Division VIII.), not in commerce. One stem.

First Prize, 10*s.* 6*d.*; Second, 7*s.* 6*d.*; Third, 5*s.*

No entry.

Class 44.—One Poeticus Daffodil (Division IX.), not in commerce. One stem.

First Prize, 10*s.* 6*d.*; Second, 7*s.* 6*d.*; Third, 5*s.*

1. W. B. Cranfield, Esq.
2. F. H. Chapman, Esq.
3. P. D. Williams, Esq.

Class 45.—One Double Daffodil (Division X.), not in commerce. One stem.

First Prize, 10*s.* 6*d.*; Second, 7*s.* 6*d.*; Third, 5*s.*

No entry.

Class 45a.—Six Leedsii Daffodils.

First Prize, £1 10*s.*; Second, £1; Third, 10*s.*

1. H. R. Darlington, Esq.
2. Duke of Rutland.
3. No award.

GENERAL MEETING.

April 30, 1912.

Mr. Arthur W. Sutton, F.L.S., V.M.H., in the Chair.

Fellows elected (55).—Miss M. Anstey, Mrs. S. Baldwin, W. E. Balston, W. Barrett, Mrs. T. G. Barrow, W. Baxter, Captain G. Beaumont, Miss J. C. Bigge, Lady Bisset, Miss Houston Boswall, Alfred Brown, Mrs. W. Burdon-Muller, Lady Burrows, Mrs. Burton, Miss Carbutt, Mrs. Vernon Carter, Mrs. F. Colborne, Miss Coles, A. Cooper, Mrs. R. Cowper, Mrs. Cull, A. C. Curtis, S. Bromley Davies, F. Edwardes, J. Ellis, Miss M. L. M. Eyres, Mrs. Fernau, Miss M. Galpin, Mrs. G. Gibbs, Lady Godson, N. Hallett, Mrs. S. Hughes, Mrs. H. Jagoe, H. S. F. Jebb, H. Kemsley, Mrs. Macdonald Marling, A. S. Marsden-Smedley, Mrs. F. E. Matthews, Mrs. Middleton, Lady Parker, R. Rhiner-Waring, Miss J. Robinson, Lady Speed, S. F. Staples, Miss E. L. Tatchell, Mrs. G. E. Thomas, Mrs. C. Tilling, Miss J. Travers, Mrs. G. C. Trewby, Mrs. M. Turner, H. G. Warburton, Mrs. Warnford-Lock, Lady Watson, J. Whitehouse, J. C. Wise.

Fellows resident abroad (2).—A. Roberts Green (S.W. Africa), S. Wakefield Shaw (N.Z.).

Associate (1).—Miss M. A. Bradley.

A lecture on "The Hereditary Characters in the Potato" was given by Dr. Redcliffe N. Salaman (see p. 34).

SCIENTIFIC COMMITTEE.

January 9, 1912.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and eleven members present.

Dracaena Goldieana.—Mr. J. T. Bennett-Poë, V.M.H., showed an inflorescence of this tropical African species, the flowers of which open at night, are whitish, jessamine-scented, and produced in a dense head. It is figured in *Bot. Mag.*, t. 6,630.

Malformed Cypripedium.—Mr. Gurney Wilson, F.L.S., showed flowers of a *Cypripedium* seedling without a labellum, from Messrs. James Veitch, which each year produced similar ones. The labellum was represented by a minute spike only.

Navel Orange.—Mr. H. Somers Rivers sent a large " St. Michael " Orange, produced on a plant which three years before had been cut down. It had the " navel " form seen usually in some varieties of Orange, but very unusual in this type. Apparently the extra vigour of the growth had induced its formation.

Odontonia × Firminii.—Mr. James O'Brien, V.M.H., drew attention to a bigeneric hybrid shown by Messrs. Firmin Lanbeau under this name. Its parentage was alleged to be *Odontoglossum crispum × Miltonia vexillaria*, but some doubt was felt as to whether one parent may not have been *Miltonia Phalaenopsis*, on account of the colouring and form of the flower. The Committee expressed a desire to see further seedlings of the cross and for further information regarding it.*

Scelochilus variegatus.—Sir Jeremiah Colman, Bart., showed this uncommon species, and on the motion of Mr. Bennett-Poë, V.M.H., seconded by Mr. Holmes, F.L.S., a Botanical Certificate was unanimously awarded.

* Monsieur Lambeau subsequently wrote as follows :

La variété dont je me suis servi avait tous ses segments blanc légèrement rosé avec quelques stries roses à la base du labelle; l'odontoglossum crispum qui a fourni le pollen était de la variété virginalis.

La graine a été semée en Février 1907, et les jeunes plantes se montrèrent d'abord très chétives; elles prirent plus de vigueur vers la fin de la seconde année.

Je possède une douzaine de plantes, dont quelques-unes assez fortes, mais qui n'ont pas fleuri. Lorsque j'aurai une plante en fleurs, je ne manquerai pas de la présenter à Londres.

J'ai fait d'autres fécondations entre le Miltonia vexillaria et des odontoglossum; j'ai notamment des plantes provenant du Miltonia vexillaria fécondé par un crispum plus vigoureux, avec un Odont. Pescatorei, enfin avec des odontoglossum maculés, notamment des hybrides d'Harryanum, mais ces plantes sont toutes plus jeunes et les plus vieilles ne fleuriront que dans un an ou deux.

J'ai aussi des hybrides entre miltonia et odontioda.

Je considère ces fécondations comme très difficiles et les quelques résultats obtenus proviennent de très nombreux essais; je n'ai jamais réussi avec un odontoglossum comme porte-graine.

Acorns with two or three radicles.—Mr. E. M. Holmes, F.L.S., showed some Acorns with two or three radicles. The embryos of which they formed part were not, however, fully developed.

Daphne odora.—Dr. Otto Stapf, F.R.S., drew attention to the fact that most of the figures in botanical works under this name represented *Daphne sinensis*, the true *D. odora* being very rarely figured, and apparently only of comparatively recent introduction into this country. In times past, at any rate, it would appear that *D. sinensis* was the more common plant. It differed from *D. odora*, a Japanese species, in having the calyx tube externally hairy. Messrs. J. Veitch exhibited the true *D. odora* at the Show on this day. Dr. Stapf showed a figure from the *Garden*, which was named *D. odora*, but which differed markedly from that species in the arrangement of its flowers.

Yucca with curious outgrowths.—Mr. Bowles showed leaves of *Yucca filamentosa flaccida* from his garden, with curious, short, hollow, horn-like lateral growths near the top of the leaves. He had seen the same thing in the same variety in the gardens of Trinity College, Dublin, and all the plants of this variety, but of this variety only, showed the peculiarity in his garden every season.

Ruscus aculeatus.—Mr. Bowles showed from a garden in Cambridgeshire a branch of *Ruscus aculeatus* bearing an extraordinary quantity of ripe berries. He took it for further examination.

Scientific Committee, January 23, 1912.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and six members present.

Ruscus aculeatus.—Mr. Bowles had examined the flowers on the fruiting branch of *Ruscus aculeatus* shown at the last meeting and found they were all male. He showed various forms, including a dwarf form from Wales with hermaphrodite flowers, the common tall form, a close-growing form collected by Mr. Paul in Epping Forest, and one with blue-green cladodes of still dwarfer form. The var. *angustifolius*, a variety with very narrow cladodes and bearing pistillate flowers, a rather stiffly-growing variety with somewhat broader cladodes, and one with very loose growth and very broad cladodes were also shown. Mr. Hales said the flowers of *Ruscus Androgynus* were variable in the same way as those of *R. aculeatus*.

Galanthus Elwesii var. poculiformis.—Mr. Bowles also showed a flower of this beautiful and robust Snowdrop, the inner segments being white without the green marks usual in Snowdrops.

Nandina domestica fruiting.—Mr. Fox, of Carmino, Falmouth, reported the fruiting of *Nandina domestica* in his garden in 1911.

Raspberry canes diseased.—Mr. Peters, of Ripley, sent canes of Raspberries showing whitish patches on the skin with tiny black spots upon them. Many canes had died, and others attacked had

grown and fruited but poorly. Mr. Massee, V.M.H., recognized the disease as due to the attack of the fungus *Hendersonia rubi*.

SCIENTIFIC COMMITTEE, FEBRUARY 6, 1912.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and ten members present.

Abnormal Cattleya.—Mr. Manda, of St. Albans, sent a *Cattleya* bearing several flowers, every one of which was abnormal, some much more markedly than others.

Castasetum Randii.—Mr. Rolfe, A.L.S., drew attention to a *Catasetum* shown by Messrs. Charlesworth, which he recognized as *Catasetum Randii*, Rolfe (*Bot. Mag.* t. 7470, where both male and female flowers are shown). This species differs from *C. barbatum* and its few allies in having the crest of the lip shortly truncate and broken up into many short filaments, not forming a single horn-like tooth. It is a native of the Amazons.

Floral drawings.—Miss Massee showed some excellent coloured drawings of various types of plants, faithfully coloured and showing dissections of the essential parts very clearly.

New Hippeastrum.—Mr. Worsley showed a new *Hippeastrum*, for which he proposed the name of *Hippeastrum Forgetii* in honour of the collector. The bulbs had been received by Messrs. Sander from Monsieur Forget, their collector in Bolivia, and the plant is closely allied to *H. pardinum*, but without spots. A full description appears at p. 73.

Chrysophlyctis endobiotica.—Mr. H. T. Güssow, of the Central Experiment Farm, Ottawa, wrote:—"From Mr. Horne's paper on 'Tumour and Canker in the Potato' in the Society's last JOURNAL we may conclude that all efforts to secure confirmation of the identity of the Potato disease with Schilberszky's from the discoverer himself were futile, and that 'it is necessary, therefore, to rely upon Schilberszky's original, somewhat meagre, description.' Early in 1905 I wrote to Professor Schilberszky, submitting a diseased tuber to him, but received no reply. Again in 1909, when I discovered the disease in Newfoundland, I wrote to Professor Schilberszky, and received a letter from him, which I very carefully kept. The following is a translation:—'Budapest, 12 March, 1910. I have the honour to inform you that I have already sent you a little time ago a statement regarding the Potato tuber which you sent me. I am now appealed to by Dr. v. Degan to write you again in the same connexion. I beg to inform you that the Potato tuber was infected by *Chrysophlyctis endobiotica*. The diseased portions alone made the identification very easy by their external characteristic appearance. I may say that in one of the infected *foci* I found masses of bacteria, which I have not examined any closer. It would interest me to have your observations on the spread of this disease in your country.—(Signed) Professor

Dr. K. Schilberszky.' " In reference to the foregoing, Mr. A. S. Horne wrote:— "It is interesting to find that Professor Schilberszky has identified the disease which was recorded by Mr. Güssow, in Newfoundland, as that described by himself in potatos derived from Upper Hungary. There were two points at issue in Britain, concerned both with the disease and the organism: (1) Professor Schilberszky stated in his published description that crater-like depressions were formed in some tubers. Symptoms of this kind were not found in potato tumour in this country. (2) At first spores of only one kind were found in this country. It is a well-known fact that tumours of a similar form may be caused by different organisms. There was confusion between the tumour in beetroot, caused by *Urophlyctis leproides*, and potato tumour. It was possible, therefore, that the tumour in the British disease might have been due to a different organism, or perhaps to more than one organism. For these reasons investigators in England desired the personal assurance of Professor Schilberszky that potato tumour was due to his *Chrysophlyctis endobiotica.*"

Scientific Committee, February 20, 1912.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and eleven members present.

Oncoba Routledgei.—Mr. Shea remarked, with reference to seedlings of this plant, that of seventeen raised by him from one fruit, fifteen were spiny and two quite without spines (see Journal R.H.S., xxxvii. pp. xxxiv, li, cxiv).

Coelogyne venusta.—Sir Frederick Moore, Glasnevin, sent an inflorescence of this interesting species. It is a native of Yunnan. On the motion of Mr. O'Brien, V.M.H., seconded by Mr. Shea, it was unanimously resolved to recommend the award of a Botanical Certificate to it.

Violets with branched peduncles.—Miss Dalton sent from Sway, Hants, a number of Violets bearing branched peduncles, and apparently more or less fasciated. They had been cultivated in the ordinary way, but in some two or three specimens two flowers were produced at the apex of the common peduncle; in others the peduncles separated lower down. Several examples of a similar nature have been sent to the Committee during the present season from widely separated localities; otherwise it appears that violets are but rarely fasciated.

New Orange.—Mr. H. S. Rivers sent a variety of Orange newly introduced, known as 'Ooushin,' 'Satsuma,' and 'Kü Seedless.' It is a Japanese variety somewhat like a Mandarin. The somewhat flat fruits shown were from maidens, and the variety is said to be almost hardy, ripening its fruit very early. The skin is thin and deep yellow; the flesh juicy, sweet, and well flavoured; quite seedless.

One of the calyx lobes in one fruit was somewhat foliose—an unusual character in the Orange. (Fig. 28.)

Pyronia ×.—Messrs. J. Veitch & Sons sent a fruit raised from Quince × Pear 'Bergamotte Esperen.' A fruit from this cross has already been shown under the name *Pyronia* × 'John Seden.' The present example was borne on a second seedling from the same parent fruit. It was highly aromatic and much more rounded than the fruit previously shown. The flesh was firm and cream in colour, the eye sunken and the cells open, one containing an apparently well-developed seed.

Diseased Tulips.—Messrs. Lowe & Shawyer sent some Tulips having poorly developed and brown-blotched leaves, the vascular tissue being marked with brownish streaks. They were referred to Mr. Massee for further examination.

Fumigation with hydrocyanic acid gas.—Mr. Hales referred to some results obtained at Chelsea Physic Garden lately in fumigating with hydrocyanic acid gas. The fumigation had been done on a very dull day, and the house had not been damped down for two days previous to the operation. The fumigation was with material of ordinary strength, but it had failed to destroy all the mealy bugs, and had caused considerable injury to many plants, especially those with somewhat succulent leaves, such as Clivias.

Scientific Committee, March 5, 1912.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, with eighteen members present, and W. Backhouse, visitor, present.

Diseased Tulips.—Mr. Massee, V.M.H., reported that the Tulips referred to him at the last meeting as making poor growth and showing brown spots on the foliage and brown flecks in the tissues of the stem had been attacked by the fungus *Botrytis cinerea*, which had apparently infected the foliage from the air in the first place—not from sclerotia in the soil, as is frequently the case.

Disa sagittalis.—Messrs. Veitch showed this species from S. Africa under the name *D. caulescens*, to which it is allied. It received a Botanical Certificate in 1890. Messrs. Veitch also showed a malformed *Cypripedium Fairrieanum* in which the scape was almost entirely suppressed.

Galls on Oak.—Mr. Aldersley sent a branch of Oak having roundish swellings of considerable size at intervals along the branches. A fungus, *Dichlaena quercina*, was probably the cause of these growths, which occur with considerable frequency on young Oaks, but rarely upon old ones.

Grapes killed by fog.—Some small flowering shoots of Grapes were sent to illustrate the damage done by London fogs, which had caused the growths to turn quite brown and shrivel.

Narcissus seedlings, &c.—Mr. Worsley made some remarks upon

the growth of Narcissi in gardens. It was the general opinion that Narcissi when allowed to grow untended may become smaller, but never, in spite of a somewhat general opinion to the contrary, revert to the specific type. Sir John Llewelyn showed flowers of wild plants from South Wales, including *N. obvallaris* and a large, deep-coloured form with something of the coloration of N. 'Golden Spur.' The plants occurring wild in South Wales showed a good many variations in form and colour of flower, but there were two types of foliage only which never seem to intergrade. Canon Fowler wrote that he sometimes found forms among such varieties as 'Emperor' producing finer flowers than the majority, and he believed these variations to be constant; one plant was found among 'Weardale Perfection' last year having two flowers of only a fourth the size of that variety, and something like *Johnstonii* in form. Mr. Malcolm, of Duns, also alluded to a sport which he had found in his garden. Sporting appears to be rather frequent. Some discussion arose as to varieties that commonly produce seed, and Mr. Williams, of Llanarth, said *N. cyclamineus* reproduced itself by seed quite freely, but seedlings died out rapidly in the grass; *N. Pseudo-narcissus* also reproduced itself freely from seed in the grass and reached flowering size. In Mr. Bowles' garden *N. pallidus praecox* is the most abundant seeder, but the seedlings rarely give the pale form, though they retain the early-flowering habit; *Pseudo-narcissus* seeds freely, as do *triandrus albus*, *variiformis*, and *cyclamineus*. Mr. Chittenden said that *N. cyclamineus* seeded very freely at Wisley, as do *N. Bulbocodium* and *N. triandrus albus;* other forms rarely produce more than a stray capsule or so. Mr. Shea had only found 'Sir Watkin' with a seed-pod once, and 'Empress' rarely seeded, but 'White Wings' did so frequently with him. Weather conditions appeared to determine to a large extent the amount of seeding that occurred, for in 1910 he found only nine varieties produce seed, but in 1911 twenty-one seeded. Possibly bees were required to effect pollination satisfactorily. He said:—"With me, out of nearly 300 distinct crosses, 'White Wings' came out easily on top. Particulars as follows:—

				Result.
Pollinated	29/4/11	× 'Lulworth' .	1 pod pollinated.	20 seeds.
,,	,,	× 'Scarlet Runner'	,, ,,	24 ,,
,,	5/5/11	× 'Virgil' . .	,, ,,	30 ,,
,,	,,	× 'Horace' . .	,, ,,	32 ,,

Self-pollinated (?) or by insects, 3 pods: 5, 8, and 4 seeds; together 17 seeds.

"Of course the above specified pollens are very potent, but they were used also with numbers of other varieties without nearly as striking results. On the other point, whether there is really much 'self-pollination,' or whether the large majority of so-called 'self-pollinations' are not really the results of insect agency, the following provide material for the latter inference I think:—

1910.—*Wet and cold all through flowering season. Very few insects about.*

	Pod.	Seeds.
'Madame de Graaf'	1	3
'Cassandra'	1	4
'Musidorus'	1	3
'Moschatus'	1	10
Result	4 pods.	

1911.—*Hot, dry, and sunny.*

	Pods.	Seeds.
'Madame de Graaf'	1	5
'Princess Mary'	1	21
'Emperor'	1	7
'Weardale Perfection'	1	11
'White Wings'	3	together 17
'Artemis'	1	5
'Alice Knights'	1	5
'Lulworth'	1	4
'Felicity'	2	42
'Apricot'	2	36
'Lady Audrey'	1	6
'Horace'	2	32
'Albicans'	1	10
'Moschatus'	1	8
'Virgil'	1	23
'Lady M. Boscawen'	2	19
'Mabel Cowan'	1	9
'Cernuus'	2	49
'Rhymester'	1	30
'Musidorus'	1	4
'King Alfred'	1	2
'Sir Watkin'	1	5
'T. B. M. Cannon'	1	2
Total	30 pods.	

"I have never known 'Sir Watkin' or 'T. B. M. Cannon' to be self-pollinated (?) before.

"The insects were 'all over the place,' and all day long, in 1911, and the Dutchmen now leave a great deal of the pollination to them; but the percental results of very good varieties are not so great as with systematic cross-fertilization, although the 'natural insects,' as Van Waveren calls them, have on occasions shown considerable judgment in the crosses which they have made." Mr. P. R. Barr found that self-fertilized seedlings of garden varieties of Daffodils tend to revert to their parent types—*e.g. Horsfieldii* self-fertilized produces numerous poor forms of *Pseudo-narcissus.* 'King Alfred,' on the contrary, produces some very pretty yellow trumpet forms, as a rule more or less dwarf than their parents. Mr. Backhouse remarked, in reference to the common belief that single wild Daffodils may sport to double forms, that seedlings resulting from the first cross between the single wild form and the double one would, some of them, be double, and the idea might have arisen in another way as well—viz. by bringing into gardens poor, and practically single because poor, forms of double Daffodils which under better cultivation would become typically double. Against this, however, is the fact that the true double form of the wild Daffodil is rare in cultivation, 'Van Zion' being the form commonly grown.

Narcissus calathinus × minimus.—Mr. Chapman showed a hybrid between these two species having the unusual character, which it shares with *N. triandrus pulchellus*, of a corona paler than the perianth pieces, the difference being quite evident. A Certificate of Appreciation was unanimously voted to Mr. Chapman in recognition of his work in raising this hybrid.

Malformed Narcissus.—Sir Frederick Moore sent a flower of a

Narcissus somewhat of the *incomparabilis* form, though not quite agreeing in some characters, having the perianth tube split half-way down between the segments, and an evident difference in colour between the inner and outer pieces. The outer perianth pieces had no corona, but the inner ones had, so that the flower bore a superficial likeness to an Iris. The stamens were six, three rising from the top and three from near the base of the tube. The plant produced this type of flower every year. Mr. Bowles remarked that he had seen a similar form in Mr. Polman Mooy's garden, which was also constant. In that case the plant was a bicolour trumpet, and had three pale perianth segments, three strap-shaped strips of corona bent down upon them, three petaloid anthers standing upright. In this case, since the petaloid stamens alternated with the three perianth pieces, the outer perianth pieces were apparently wanting.

Primula Knuthiana.—Messrs. Veitch showed a *Primula* which had been identified at Kew as *P. Knuthiana* of Pax, but which was a much finer flower than that figured by Pax in his monograph under that name. It had been raised from seed sent home by Messrs. Veitch's collector, Mr. Purdom, and was much like the form of *P. farinosa* grown in gardens under the erroneous name of *P. frondosa*. It was, however, distinct from that plant. The Committee expresed a wish to see further seedlings of this plant.

Amygdalus × praecox.—Messrs. Veitch sent flowering branches of *Amygdalus × praecox*, raised by crossing *Amygdalus persica magnifica* with *A. Davidiana alba*. The hybrid had pink flowers like *A. persica*, but of about the size of *A. Davidiana*, and retained the early-flowering habit of *Davidiana*.

Double Hyacinth.—An uncommon double form of Hyacinth like the varieties figured in old Herbals was sent by Mrs. Rooper. It had been purchased under the name of 'Italian Hyacinth.'

Scientific Committee, March 19, 1912.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, with thirteen members present, and Rev. J. Jacob, visitor.

Hybrids with Narcissus calathinus.—Rev. G. Engleheart, V.M.H., made some remarks regarding the apparently very restricted distribution of this beautiful form of *Narcissus triandrus*. It is not apparently found outside a small area on an island in South Europe, about $1\frac{1}{2}°$ out of the latitude in which the type occurs on the mainland of Spain and Portugal. He also showed a beautiful and vigorous white hybrid between this and a variety of *N. Leedsii* which might be likened to a hardy *Eucharis*. Several of these white and vigorous seedlings had now been raised. The Committee unanimously recommended a Certificate of Appreciation to Mr. Engleheart for his work with these hybrids.

Osyris alba.—Mr. Holmes, F.L.S., showed roots of vines attached

to which were the suckers of the parasite *Osyris alba*, a plant belonging to the family Santalaceae. This parasite attaches itself to the roots of a large number of plants, over sixty hosts being known, but up to now it has not been recorded as attacking the vine. The specimen came from Montpellier.

Camellia Tuckiana.—Mr. Bennett-Poë, V.M.H., showed flowers of a seedling *Camellia*, which he had raised from seed ripened in South France, now flowering for the first time in a cold greenhouse. The flowers were single, about three inches in diameter, of a delicate pink, with numerous yellow stamens. It had been identified as *Camellia Tuckiana.*

Beetles in Beans.—Canon Fowler showed French Beans attacked by the beetle *Bruchus lentis*. This and other species of *Bruchus* are well-known pests of various species of Bean and Pea, boring holes into the cotyledons, but they appear rarely to interfere with germination.

Athyrium with bulbiferous sori.—Mr. Druery, V.M.H., showed portions of the fronds of *Athyrium Filix-foemina plumosum* with large numbers of small plants arising from the sori, each sorus producing several bulbils.

Snowdrops.—Mr. Bowles showed specimens and drawings of a double green Snowdrop in which both stamens and ovary were aborted and replaced by rather narrow, foliose segments. He also exhibited the double yellow form of *Galanthus nivalis*, and drawings of the white form of *G. Elwesii*—poculiformis—recently shown by him, to demonstrate that there were a few small green lines on the inner perianth pieces of that flower.

Malformed Orchids.—Mrs. Taylor, of Bowerdens, Henley-on-Thames, sent two abnormal flowers from a newly imported plant of *Dendrobium Wardianum giganteum.* In one of them two stamens of the outer whorl had developed and become petaloid and bore pollen sacs on their inner edges near the base. In the other the column bore at its apex three stamens, the usual one fully, the other two partially developed, and three lips, inside one another, but the two inner and progressively smaller ones arising slightly to the right and left respectively of the normal one. Mr. Gurney Fowler sent an *Odontoglossum* with four symmetrically disposed outer perianth pieces, six inner perianth pieces, including two lips, and two normal columns, side by side. The ovary also was double, but fused into one.

Scientific Committee, April 2, 1912.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and eleven members present.

Schomburgkia Lueddemanii, Prill.—Sir Frederick Moore sent a flowering spike of this uncommon species, figured in the *Bot. Mag.* t. 8427. Some discussion arose regarding its distinctness from

S. undulata, but the Director of the Royal Botanic Gardens, Kew, to whom it was referred, says it is distinguished from that species by a bright yellow crest to the lip and other differences. It appears to have been lost sight of since 1862, and even now its habitat is unknown. *S. undulata* has been figured several times (see Lindl. *Bot. Reg.* xxxi. t. 53; Will. *Orch Alb.* v. t. 335; Warn. *Sel. Orch.* ii. t. 21; Cogn. *Dict. Orch. Draw.* xlix. t. 33), and always without the yellow disc.

Draba rupestris.—Mr. Fraser, F.L.S., showed a specimen of *Draba rupestris* in a pot, in which condition the plant grows much more dwarf and compact than when in a rock-garden in free soil, attaining in the latter conditions to about six inches in height, and in the former to only about three inches, though flowering quite as freely.

Clivia miniata.—Mr. J. W. Odell showed an inflorescence of *Clivia miniata* with one of the bracts foliose and about seven inches in length.

Narcissus sporting.—Mr. Shea showed a variety of Daffodil which had appeared among plants of 'Empress,' but which had a much flatter perianth and no green coloration at the back; the mouth of the corona was wider and the colour somewhat paler. The evidence as to its origin did not appear conclusive, and the Committee were inclined to regard it as probably a seedling from 'Empress.'

Narcissus malformed.—Rev. J. Jacob sent a flower of *Narcissus* having the perianth segments three-lobed instead of entire, as is usually the case.

Elaeagnus sp. fruiting.—Mr. Durham sent from Salcombe, South Devon, *Elaeagnus macrophylla*, *E. Fredericii* 'Anna,' and *E. pungens variegata*, each bearing ripe fruits. The pink berries of the first named with their silver scales are particularly beautiful.

Scientific Committee, April 16, 1912.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and fourteen members present.

Stachys palustris.—Mr. Fraser, F.L.S., showed a specimen of the rhizome of this common British plant, and remarked on the similarity between it and the Chinese *Stachys tuberifera*, the rhizomes of which are edible.

Result of crossing a 'rogue' Wall-flower.—Professor Henslow exhibited sprays of golden and crimson Wall-flowers. They originated from a 'rogue' which appeared in his garden at Leamington. The flowers had no petals, and the six stamens were represented by open but more or less united carpels round the normal central pistil. He pollinated some of the flowers from a red variety and others from a golden-yellow sort. The pods ripened and bore a fair amount of seed, but the staminate-carpels much less than the normal one in the middle. The seed was sown and the plants raised at Wisley in the gardens of the Royal Horticultural Society. Both sorts

produced very fine blossoms, some being an inch and a half across. Not a single 'rogue' appeared; but a few of the red ones were striped with yellow. This, however, was, according to Mr. Sutton's and Mr. Chittenden's observations, a result of chill by a north-east wind.

Tasmanian Orchids.—Mr. Odell showed on behalf of Mr. Andrew Kingsmill an interesting series of coloured photographs of Tasmanian Orchids, representing the following terrestrial genera:—*Pterostylis*, *Chiloglottis*, *Caladenia*, *Diuris*, *Calochilus*, *Dipodium*, *Glossodia*, and *Diplarrhena*.

Ranunculus Ficaria.—Mr. Chittenden showed a semi-double form of *Ranunculus Ficaria* having several series of strap-shaped petals, green on the outside, as well as two or three whorls of stamens. It had appeared in the gardens at Wisley.

Carpentaria californica.—Mr. Odell showed foliage of this plant spotted with numerous brown spots owing to the attack of the fungus *Cladosporium herbarum*.

Lilium candidum diseased.—Mr. E. H. Jenkins sent leaves of *Lilium candidum* showing numerous æcidia of a *Uromyces*, which was referred to Mr. Chittenden for further examination, and which proved to be *U. Erythronii*.

Petrea volubilis.—Rev. F. Page-Roberts sent a dried inflorescence of a climbing plant with blue flowers from Ceylon, which was recognized as the American *Petrea volubilis*, a plant which varies considerably in colour.

Bicoloured Hyacinth.—Mr. W. B. Gingell, of Dulwich Park, sent an inflorescence of a Hyacinth having one side red, the other blue, which was referred to the Rev. Professor Henslow for further examination.

Gooseberry, racemose form.—Mr. W. G. Smith, of Dunstable, sent drawings illustrating flowers and fruit of a racemose form of Gooseberry, which had been referred to previously as a hybrid between the Gooseberry and the Black Currant on account of the thickly produced clusters of very dark berries and their flavour, which was said to be intermediate between the Gooseberry and Black Currant. On careful examination of the flowers and fruit he had, however, been unable to find any trace of Black Currant. The plant appeared to be wholly Gooseberry, with flowers and fruit borne in racemes of from two to five. He could detect no Black Currant flavour, although the taste was delicious and strong. No oil glands are present on any part of this new form, and the fruits are perfectly glabrous. The pollen is exactly that of the garden Gooseberry. It flowers three weeks in advance of the Black Currant. The merit of the plant lies in its great fruit-producing properties, as on a given length of branch it produces more fruit in weight than probably any other bush extant. The colour of the fruit when ripe is deep, almost black, maroon or dark mahogany, becoming black. The cuttings strike freely in any soil, many of last year's shoots being nearly a yard in length. Seeds sown by Mr. Smith did not germinate. The plant originated as a

FIG. 28.—ORANGE 'SATSUMA.' (*Gardeners' Chronicle.*) (p. xxxiv.)

[*To face p.* x]

Fig. 29.—Ribes Grossularia: racemose form (Ovary glabrous). Natural size. Pollen × 150.

Fig. 30.—Ribes Grossularia : racemose form. Natural size.

FIG. 31.—BLACK CURRANT, FOR COMPARISON WITH GOOSEBERRY (fig. 29). Pollen × 150.

seedling in a market-grower's garden in the South of England, where it was regarded as a variety more curious than useful. (Figs. 29, 30, 31.)

Scientific Committee, April 30, 1912.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and twelve members present.

Hybrid Saxifrages.—Mr. J. Fraser reported on Saxifrages sent by Dr. Blaxall, of Edgware, as follows:—The two Saxifrages were hybrids between *S. granulata* and either one of the group of *S. muscoides Rhei* or *S. decipiens*. All the characters of the hybrids were different from those of either parent. No. 1 had the stamens more or less imperfect, the petals shortened, the flower flattened, and the disc greatly enlarged. The stem was shortened, forming a compound corymbose cyme. The leaves were deeply lobed on the tripartite plan, much divided and with more acute lobes, not rounded as in *S. granulata*. The basal leaves formed a rosette, with short, broad, flattened petioles, these characters being derived from the dactyloid parent. The bulbils at the root and in the axils of the basal leaves were in a more or less leafy condition, and some of them had developed into leafy branches, especially in No. 2. The styles of both were divaricate in fruit, as in the dactyloid parent, not erecto-patent as in *S. granulata*.

Albino form of Orchis mascula.—Mr. Gurney Wilson, F.L.S., showed an albino form of *Orchis mascula* collected by him in a field in Mid-Sussex.

Jack fruit.—Mr. O'Brien, V.M.H., showed on behalf of J. S. Bergheim, Esq., of Belsize Court, Hampstead, a Jack fruit (*Artocarpus*) brought from Brazil.

Arsenic in drainage water.—Dr. Voelcker remarked on some water he had recently received for analysis which had come from a stable and had been reputed to injure plants. He had found it to contain an appreciable quantity of arsenic, which was no doubt the cause of the injury. He had found that many plants would absorb a certain amount of arsenic from the soil without any appreciable injury, but in this case the quantity had been too great. Mr. O'Brien made the following remarks, which suggest a probable source of the arsenic:—"I remember to have often heard of those in charge of horses giving them small doses of arsenic to improve their condition, and many a good horse has died suddenly from 'heart trouble' in consequence. Of course it is done secretly. But if done at all it would account for the presence of arsenic in the stable. If pure arsenic cannot be had on account of the restrictions, might not the knowledge that it is present in weed-killer cause small doses of that to be mixed with the food and the surplus thrown on the floor? The arsenic must have got in somehow, and this is as likely a way as any."

Orange with yellow stripe.—Mr. Holmes, F.L.S., reported on an Orange which had a narrow yellow stripe down one side passing from

base to apex, and could find nothing inside the fruit in connexion with it. He suggested that it was probably a hybrid between the Orange and the Grape fruit.

Scilla hispanica with long bracts.—Mr. Worsley showed from his garden an inflorescence of *Scilla hispanica* analogous to the variety *bracteata* of *Scilla nutans*. The bracts were many times longer than the pedicels.

Tulip with displaced perianth piece.—Mr. Shea showed a Tulip with a displaced perianth lobe a few inches below the flower, which had but five perianth pieces.

Parrot Tulip.—Messrs. Barr, of Taplow, showed a new break, 'Sensation.' The colour in the specimen was not fully developed. So far as could be determined from investigations made in Holland, this break suddenly appeared in a bed of the Dutch Breeder Tulip known as Reine d'Espagne (of which a specimen flower was exhibited) in the nursery of a small Dutch grower. It is much dwarfer than its Breeder parent, and also propagates more slowly. A Botanical Certificate was recommended to this plant on the suggestion of the Narcissus Committee. The variety had none of the horn-like excrescences usual in Parrot Tulips, and had a stem like that of a Darwin Tulip.

Double Primrose.—A double primrose found growing wild was exhibited from an unknown source.

Irises.—Mr. W. Rickatson Dykes, of Farncombe, sent Irises, with notes as follows, making clear the origin of *I. florentina* and *I. albicans*:—*I. germanica* L. *var.*—This variety is one that is largely grown for producing Orris-root in the neighbourhood of Florence. Its stem is more slender than that of the varieties usually grown in England. It is probably the form of which *I. florentina* is the albino. *I. florentina.*—This is an albino form of a variety of *I. germanica*. Compare the spathes and the inflorescence. *I. Madonna*, Sprenger.—A comparatively recent introduction from Arabia. Compare its flowers, spathes, and inflorescences with those of *I. albicans*. There can be little doubt that it is the purple form of which *I. albicans* is the albino. *I. albicans*, Lange.—Contrast the flower, spathes, and inflorescence with those of *I. florentina*, and compare them with those of *I. Madonna*, of which it is the albino form. *I. albicans* and *I. Madonna* both come from the Yemen in Arabia, and the former, used as a graveyard ornament, has spread wherever the Mohammedans have penetrated. *I. Reichenbachii*, Heuffel.—This Iris, of which both purple and yellow flowered forms can be raised from the same capsule of seed, is the common dwarf Iris of the Balkans, corresponding to *I. chamaeiris* in Southern France and Northern Italy. N.B.—The sharply keeled spathes, as contrasted with those of *I. chamaeiris*. *I. balkana* (Janka), *I. serbica* (Panc), *I. bosniaca* (Beck), *I. Skorpilii* (Velen), are some of the many synonyms of this Iris. *I. chamaeiris*, Bertolini.—This is the common dwarf Iris of the South of France and of Northern Italy. It is easily distinguished from *I. pumila* by its visible stem and short tube, and from *I. Reichenbachii* by the spathes.

which are not acutely keeled. The flowers are very variable in colour, and this variability has given rise to numerous synonyms—*e.g.* *I. italica* (Parl.), *I. lutescens* (Lam.), *I. Olbiensis* (Hénon), and *I. virescens* (Delarb.) A Certificate of Appreciation was unanimously awarded to Mr. Dykes.

Hyacinth with Violet and Magenta Flowers on the same Stem.—This specimen showed a case of " dissociation " of colours. It was remarkable for having the flowers on one half of the scape—*i.e.* from bottom to top—violet, the other half being a rose-tinted magenta. The arrangement of the vascular bundles of the stem did not indicate any signs of a fusion between two stems. Moreover, the phyllotaxis was continuous, thus also indicating a single inflorescence. The epidermis was of a purplish-green colour down one half of the stem which bore the violet flowers, that of the other half was pale green. All the flowers issuing from the former side were of a dark-violet colour, and all from the latter a rose-magenta. A few along the lines of junction were parti-coloured; some flowers had one or more lobes of the perianth of one colour, the remainder being of the other. The lobes of some were divided down the middle half, a lobe being of each colour. The rose-magenta flowers varied in having six to eight lobes, the entire flower being smaller than the violet ones. It would appear, therefore, that in one half of the flowers *blue* was largely wanting. Comparing the colours with a standard list, magenta is recorded as having forty-five parts red to forty-nine blue, while violet has twenty-one red and sixty-nine blue; so that the blue element is greatly suppressed in the magenta but present in the " rose " tint. Under electric light when blue is absorbed the violet flowers appear grey and the rose-magenta a pure red.

Hybrid Pelargoniums.—Mr. A. Langley-Smith, of Catford, showed hybrid pelargoniums as follows:—

Hybrid Pelargonium ' Cataract ' (*P. Radula minor* × *P. denticulatum*, ' Pheasant's Foot ') has the finely cut leaf of *P. Radula*, with the scent of *P. denticulatum*. When grown in poor soil it can only be distinguished from *P. Radula* by the scent. In good soil, however, the growth is rampant, the leaves are very large, and the tips curl over. Hence the name chosen. The bloom is almost identical with that of *P. Radula*, and the plant is, like its seed-parent, apparently self-sterile.

Hybrid Pelargonium ' Jonathan Smith ' (*P. denticulatum* × *P.* seedling 18) resembles *P. denticulatum* in leaf and scent, though the leaf is somewhat blunter, lighter in colour, and more leathery. In habit and in shape and colour of bloom it resembles the pollen-parent, the blooms under good cultivation being perfectly circular, and it is heavily blotched with maroon on the two upper petals. The plant is sterile.

Hybrid Pelargonium ' Patience ' (*P. tomentosum* × *P. filicifolium* var. ii.).—A perfect blend of the characteristics of the two parents, having the hoariness of *P. tomentosum*, with leaf and bloom halfway between the two in shape, size, and colour, and a compound scent in

which perhaps the scent of *P. filicifolium* predominates. The plant is apparently sterile.

Hybrid Pelargonium 'Felicity' (*P. tomentosum* × *P. filicifolium* var. i.) differs from the preceding in being less hoary, lighter in colour, and having the dark marking in the young foliage more pronounced—in these respects being nearer to the pollen-parent; yet the shape of leaf, habit of plant, and scent more closely resemble *P. tomentosum*. The plant is sterile so far.

Hybrid Pelargonium Tomentosum Smithii (*P. tomentosum* × *P. denticulatum* 'Pheasant's Foot').—Except in hoariness and habit this plant resembles its seed-parent in no particular, and it only shows the influence of the pollen-parent in the shape, size, and marking of the bloom. The foliage is noble, the leaves being very large, and the edges of the leaves curl towards the centre. As the leaves die they gradually droop towards the stem until they finally lie parallel with it and, like the leaves of many herbaceous species, seem to hang on indefinitely. As they die they change to a vivid crimson, and the dead leaves retain quite a maroon-crimson colour. The bloom is purplish-lilac in colour with maroon markings, and fades to pale lilac as it grows older, so that frequently we have flowers of two distinct colours in the same truss. The plant is, I believe, quite fertile, but am uncertain, as it only bloomed for the first time this April.

FRUIT AND VEGETABLE COMMITTEE.

January 9, 1912.

Mr. J. Cheal in the Chair, and eighteen members present.

Awards Recommended :—

Gold Medal.

To Messrs. Rivers, Sawbridgeworth, for Oranges.

To Messrs. Veitch, Chelsea, for Apples.

Silver Knightian Medal.

To F. Bibby, Esq. (gr. Mr. J. Taylor), Shrewsbury, for Apples and Pears.

To Messrs. Sutton, Reading, for vegetables and salads.

Silver Banksian Medal.

To Mrs. Denison (gr. A. G. Gentle), Berkhamsted, for Potatos.

Award of Merit.

To Pear 'Mrs. Seden' (votes, unanimous), from Messrs. J. Veitch, Chelsea. A cross between 'Seckle' and 'Bergamotte Esperen.' Fruit of medium size, rather turbinate in shape; skin pale yellow, flushed on the sunny side with bright red, and covered with minute cinnamon dots; stalk 1 inch long, deeply inserted in a narrow cavity; eye small, in a shallow basin; segments closed; flesh melting, full of juice, and of delicious flavour. (Fig. 32.)

Cultural Commendation.

To Mr. G. Woodward, Maidstone, for Pear 'Passe Crassane.'

Other Exhibits.

Mr. Crook, Camberley: Apples.

Mr. A. Dean, Kingston: Apples.

Mr. J. H. Goodacre, Derby: Apple 'Northern Spy,' of excellent flavour.

T. Robinson, Esq., Bristol: Apples.

Messrs. Smith, Woodbridge: Apples.

V. G. Stapleton, Esq., Stamford: Apples.

Fruit and Vegetable Committee, January 23, 1912.

Mr. J. Cheal in the Chair, and nine members present.

Awards Recommended :—

Gold Medal.

To Messrs. Bunyard, Maidstone, for Apples.

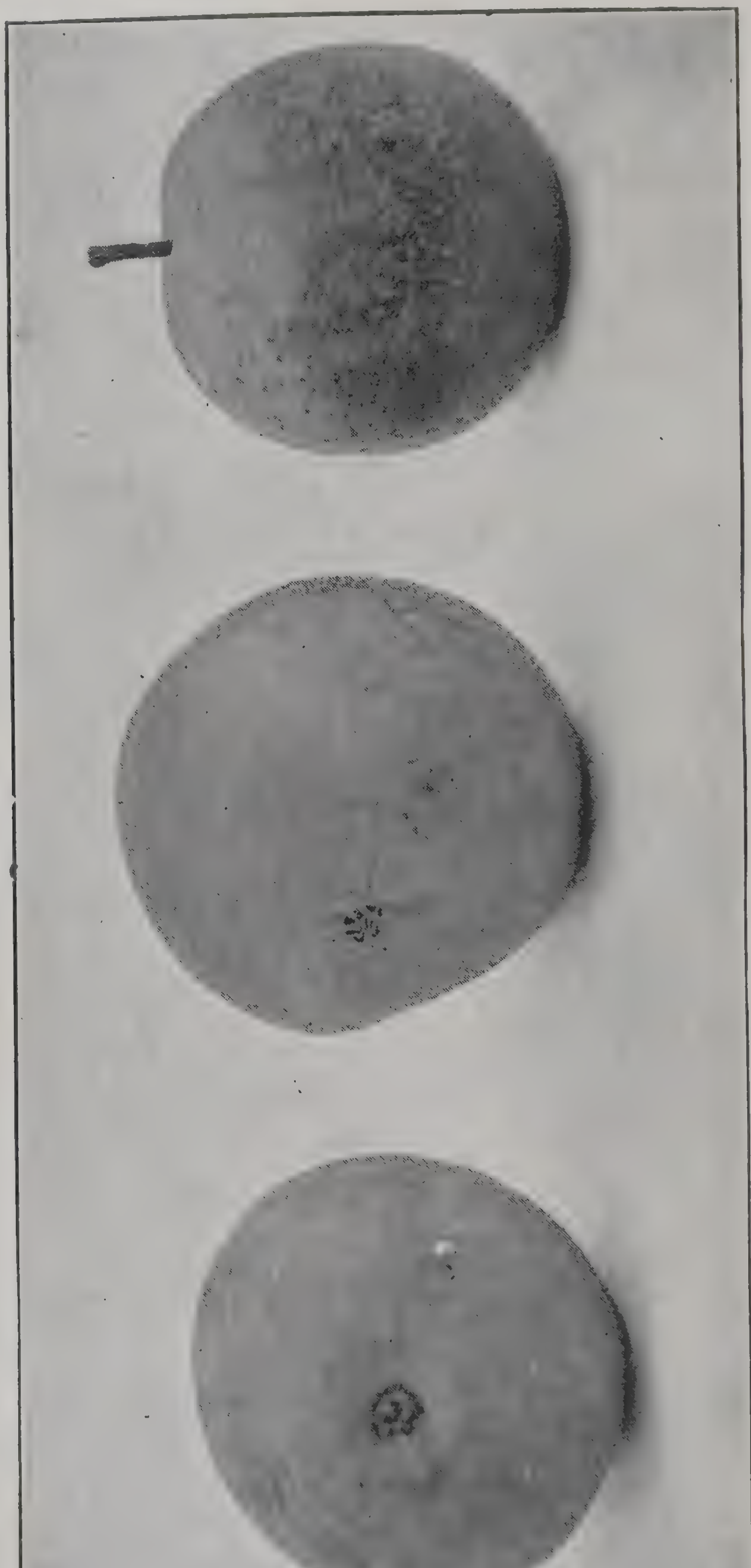

Fig. 32.—Pear 'Mrs. Seden.' (*Journal of Horticulture.*) (p. xlv.)

Silver Knightian Medal.

To Messrs. Seabrook, Chelmsford, for Apples.
To Messrs. Sutton, Reading, for vegetables.

Silver Banksian Medal.

To Mr. W. E. Sands, Hillsborough, Ireland, for seed Potatos.

Other Exhibits.

R. Abbay, Esq., Framlingham: Apples.
W. B. M. Bird, Esq., Chichester: Apples.
Mrs. Miller, Marlow: 'Moyleen' confections.
F. W. Platt, Esq., Highgate: Apples.
R.H.S. Gardens, Wisley: forced Rhubarb.

Fruit and Vegetable Committee, February 6, 1912.

Mr. Joseph Cheal in the Chair, and thirteen members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Sutton, Reading, for early Broccoli.

Other Exhibits.

Mr. H. Becker, Jersey: Apples.
Mrs. Miller, Marlow: 'Moyleen' confections.
Miss Ough, Streatham Common: fruit studies.

Fruit and Vegetable Committee, February 20, 1912.

Mr. Joseph Cheal in the Chair, and fourteen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Sutton, Reading, for vegetables.

Silver Banksian Medal.

To Lord Falmouth (gr. Mr. Hogbin), Mereworth Castle, for Apples.
To Mr. W. H. Honess, Holmbury St. Mary's, for Lettuce.
To Miss H. G. Sewell, South Kensington, for jams.
To Sir J. Wernher, Bart. (gr. Mr. A. W. Metcalfe), Luton, for Apples.

Award of Merit.

To Apple 'Oatlands Seedling' (votes, unanimous), from Mr. F. G. Gerrish, Tring. Fruit of medium size, flattish, round; skin pale green, slightly tinged and streaked with red on the sunny side; stalk short, thin, ½ inch long, inserted in a rather deep russety

cavity; eye closed with incurved segments in a very shallow basin; flesh crisp, juicy, and of fine flavour. Raised from 'Cox's Orange Pippin' × 'Sturmer Pippin.' A very promising late dessert variety.

Other Exhibits.

Mr. J. Sloan, Melton Mowbray: Apples.
Mr. W. Strugnell, Trowbridge: Apples.

FRUIT AND VEGETABLE COMMITTEE, MARCH 5, 1912.

Mr. J. CHEAL in the Chair, and twenty-one members present.

Awards Recommended:—

Silver-gilt Knightian Medal.

To the Duke of Rutland (gr. Mr. Divers), Grantham, for Apples.

Silver Knightian Medal.

To Messrs. Sutton, Reading, for vegetables.

Other Exhibits.

Mr. H. Becker, Jersey: machine for cleaning and grading fruit.

FRUIT AND VEGETABLE COMMITTEE, MARCH 19, 1912.

Mr. A. H. PEARSON in the Chair, and twenty members present.

Awards Recommended:—

Silver Knightian Medal.

To Messrs. Sutton, Reading, for salads.

Silver Banksian Medal.

To Messrs. Dianellos and Vergopoulos, Cyprus, for Oranges.
To Sir Daniel Gooch, Bart. (gr. Mr. W. Heath), Chelmsford, for Apples.
To F. E. Wienholt, Esq., Eltham, for Apples.

Cultural Commendation.

To Messrs. Carter, Raynes Park, for Lettuce.
To Mr. G. Woodward, Maidstone, for Apple 'Lane's Prince Albert.'

Other Exhibits.

Mr. H. Cotterell, Elsenham: Specimens of grafts.
Mr. T. Lamb, Bingham, Notts: Apples.
Duke of Rutland, Grantham: Apple 'Belle de Boskoop.'

Fig. 33.—Carnation 'Wivelsfield Wonder.' (*Allwood.*) (p. l.)

[*To face p.* xlviii.

Fig. 34.—Primula Knuthiana. (*Veitch.*) [p. [illegible]]

FIG. 44. VIBURNUM DAVIDII. (*Veitch.*) (p. lxiii.)

Fig. 45. Carnation 'Wodenethe.' [illegible]

FRUIT AND VEGETABLE COMMITTEE, APRIL 2, 1912.

Mr. A. H. PEARSON in the Chair, and fifteen members present.

Awards Recommended :—

Cultural Commendation.

To Hon. J. Ward, Hungerford, for an exhibit of Apple 'Northern Spy.'

Other Exhibits.

Mr. E. Patterson, Carlisle: Apple 'Michaelmas Day.'
Messrs. Sutton, Reading: Cabbages.

FRUIT AND VEGETABLE COMMITTEE, APRIL 16, 1912.

Mr. A. H. PEARSON in the Chair, and fourteen members present.

Awards Recommended :—

Silver-gilt Knightian Medal.

To Messrs. Sutton, Reading, for early vegetables and salads.

Silver Banksian Medal.

To Mrs. Bischoffsheim, Stanmore, for Strawberries.

FRUIT AND VEGETABLE COMMITTEE, APRIL 30, 1912.

Mr. GEO. BUNYARD, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended :—

Gold Medal.

To Messrs. Sutton, Reading, for vegetables and salads.

Silver-gilt Banksian Medal.

To Messrs. Veitch, Chelsea, for vegetables.

Silver Banksian Medal.

To S. W. Worthington, Esq. (gr. Mr. P. Edington), Whitchurch, Salop, for apples.

Other Exhibits.

Mr. R. Abbay, Framlingham, apples.
Mr. J. S. Bergheim, Hampstead, tropical fruits.
S. Heilbut, Esq. (gr. Mr. G. Camp), Holyport, vanilla pods.

FLORAL COMMITTEE.

JANUARY 9, 1912.

Chairmen { Mr. W. MARSHALL, V.M.H. (Groups).
Mr. H. B. MAY, V.M.H. (Committee).

Twenty-six members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. Cutbush, Highgate, for miscellaneous flowering plants.

To Messrs. W. Paul, Waltham Cross, for Camellias.

Silver Flora Medal.

To Mr. H. Burnett, Guernsey, for Carnations.

To Messrs. Cannell, Swanley, for Zonal Pelargoniums.

To Messrs. Low, Bush Hill Park, for Carnations and greenhouse plants.

To Messrs. May, Upper Edmonton, for ferns.

To Messrs. Veitch, Chelsea, for greenhouse plants.

Silver Banksian Medal.

To Mr. L. R. Russell, Richmond, for flowering trees and shrubs

Bronze Flora Medal.

To Messrs. Allwood, Hayward's Heath, for Carnations.

Bronze Banksian Medal.

To Mr. E. Guile, Newport, Essex, for Carnations.

Award of Merit.

To Carnation 'Wivelsfield Wonder' (votes, 11 for, 5 against), from Messrs. Allwood, Hayward's Heath. A fancy perpetual-flowering variety with a white ground rather heavily flaked with deep pink. The flowers are large and the calyx non-bursting. The stems are stiff and of a good length for cutting. (Fig. 33.)

Cultural Commendation.

To Messrs. Sutton, Reading, for *Lachenalia pendula.*

Other Exhibits.

Mrs. Baldwin, Cambridge: very fine fruiting sprays of *Ruscus aculeatus.*

Messrs. Barr, Covent Garden: Freesias and hardy plants.

Messrs. Cheal, Crawley: rockery.

Mr. C. Engelmann, Saffron Walden: Carnation 'Lady Northcliffe.'

Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree: *Berberis pruinosa* and *Symphoricarpus racemosus purpureus.*

Misses Hopkins, Shepperton: hardy plants.

H. Howard, Esq., Purfleet: *Petasites fragrans.*

G. D. Mills, Esq. (gr. Mr. J. Macdonald), Ringwood: *Primula malacoides bisternensis.*

J. P. Milton, Esq. Penzance: *Camellia Alberti.*

Messrs. Peed, Mitcham: alpines.

Mr. G. Reuthe, Keston: hardy plants.

Messrs. Wells, Merstham: Carnations.

Messrs. Young, Cheltenham: Carnations.

Floral Committee, January 23, 1912.

Mr. H. B. May, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. Cutbush, Highgate, for miscellaneous flowering plants.

Silver Flora Medal.

To Mr. H. Burnett, Guernsey, for Carnations.

To Leopold de Rothschild, Esq., C.V.O. (gr. Mr. G. Reynolds), Gunnersbury Park, Acton, for *Jasminum primulinum.*

To the Marquis of Salisbury (gr. Mr. H. Prime), Hatfield, for *Euphorbia jacquinaeflora* and *Saintpaulia ionantha.*

Silver Banksian Medal.

To Rev. H. Buckston (gr. Mr. A. Shambrook), Derby, for Cyclamen.

To Messsr. Gill, Falmouth, for Rhododendrons and paintings of fungi.

To Messrs. Low, Bush Hill Park, for Carnations and Cyclamen.

To Messrs. May, Upper Edmonton, for ferns, &c.

To Mr. L. R. Russell, Richmond, for flowering shrubs and Primulas.

To Messrs. Sutton, Reading, for Cyclamen and Primulas.

To Messrs. Veitch, Chelsea, for greenhouse plants.

Bronze Flora Medal.

To Messrs. Barr, Covent Garden, for hardy plants.

To Mr. B. E. Bell, Guernsey, for Carnations.

Bronze Banksian Medal.

To Messrs. Cannell, Swanley, for Begonias.

To Mr. Engelmann, Saffron Walden, for Carnations.

To Messrs. T. S. Ware, Feltham, for alpines.

Other Exhibits.

Messrs. Allwood, Hayward's Heath: Carnations.
Messrs. Carter, Raynes Park: Primulas.
Messrs. Cheal, Crawley: alpines.
Guildford Hardy Plant Nursery, Guildford: hardy plants.
Mr. E. Guile, Newport: Carnation 'Lady Meyer.'
Misses Hopkins, Shepperton: hardy plants.
Mr. F. W. Ladds, Swanley: Pelargoniums.
Messrs. Carter Page, London Wall: Cyclamen and *Primula malacoides*.
Messrs. Peed, Mitcham: alpines.
Mr. G. Reuthe, Keston: hardy plants.

FLORAL COMMITTEE, FEBRUARY 6, 1912.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Cuthbert, Southgate, for forced shrubs.
To Messrs. May, Upper Edmonton, for a collection of fronds of nearly all the known species and varieties of *Nephrolepis*.

Silver-gilt Banksian Medal.

To Mr. H. Barnett, Guernsey, for Carnations.

Silver Flora Medal.

To Miss Massee, Kew Gardens, for drawings of fungi and flowers.
To Messrs. W. Paul, Waltham Cross, for Camellias.
To Messrs. Veitch, Chelsea, for greenhouse plants.

Silver Banksian Medal.

To Messrs. Cutbush, Highgate, for flowering shrubs and Carnations.
To Messrs. Low, Enfield, for greenhouse plants, Carnations, and Cyclamen.
To Messrs. Mount, Canterbury, for Roses.

Bronze Flora Medal.

To Messrs. Allwood, Hayward's Heath, for Carnations.
To Mr. B. E. Bell, Guernsey, for Carnations.
To Mr. L. R. Russell, Richmond, for hardy flowering shrubs and *Debregeasia velutina*.

Bronze Banksian Medal.

To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Mrs. Swinburne-Hanham, South Hampstead, for paintings of wild flowers.

Award of Merit.

To Carnation 'Triumph' (votes, 16 for), from Mr. C. Engelmann, Saffron Walden. An excellent crimson perpetual-flowering variety of robust habit. The flowers are large, of good shape, and are delicately scented. The calyx is non-bursting, and the flower-stems are strong and stiff. (Fig. 48.)

Other Exhibits.

Messrs. Barr, Covent Garden: bulbous plants.
Mr. F. H. Chapman, Rye: bulbous plants.
Messrs. Cheal, Crawley: flowering shrubs.
Misses Hopkins, Shepperton-on-Thames: hardy plants.
Countess of Ilchester, Dorchester: *Senecio Petasitis.*
E. Shoosmith, Esq., Arlington: *Chimonanthus fragrans.*
Messrs. Sutton, Reading: plant to be named, identified as *Origanum Tournefortii.*
Messrs. Thompson & Charman, Bushey: rock garden.
Messrs. T. S. Ware, Feltham: alpines.
Messrs. Wells, Merstham: Carnations.

FLORAL COMMITTEE, FEBRUARY 20, 1912.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended:—

Gold Medal.

To Mr. W. E. Wallace, Eaton Bray, Dunstable, for Carnations and Roses.

Silver-gilt Flora Medal.

To Miss Gundry, Foots Cray, for paintings.

Silver-gilt Banksian Medal.

To Mr. L. R. Russell, Richmond, for hardy flowering shrubs.

Silver Flora Medal.

To Mr. H. Burnett, Guernsey, for Carnations.
To Messrs. Cutbush, Highgate, for bulbs, forced shrubs, alpines, and Carnations.
To Messrs. Low, Bush Hill Park, for Carnations, Cyclamen, &c.
To Messrs. May, Upper Edmonton, for epiphytal ferns.
To Messrs. Sutton, Reading, for Cyclamen and Primulas.
To Messrs. Veitch, Chelsea, for greenhouse plants, standard Azaleas, &c.

Silver Banksian Medal.

To Mr. A. F. Dutton, Iver, for Carnations.
To Mr. G. Reuthe, Keston, for hardy plants.
To Messrs. Wallace, Colchester, for bulbous plants.

Bronze Flora Medal.

To Messrs. Cannell, Swanley, for Zonal Pelargoniums, Cyclamen, and Cinerarias.

Award of Merit.

To Carnation 'Lady Meyer' (votes, 11 for, 4 against), from Mr. E. Guile, Newport, Essex. A new perpetual-flowering variety of excellent form and large size. The flowers are of a delicate pale-pink and look well under artificial light. The petals are prettily fringed.

FIG. 35.—CARNATION 'LADY MEYER.' (*Guile.*)

and the calyx is non-bursting. The flowers are devoid of scent, and the plant is said to be a vigorous grower. (Fig. 35.)

To *Ribes laurifolium* (votes, unanimous), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Aldenham House, Elstree. A new flowering shrub raised from seeds sent home from China by Mr. E. H. Wilson, V.M.H. The ovate lanceolate leaves measure about $4\frac{1}{2}$ inches long by 2 inches broad. They are thick, serrate, and dark-green in colour, but when fully grown they become tinged at the margins with a pleasing purple shade. The light-green flowers are produced in

axillary racemes in February, and the rather large pale-green bracts are very noticeable. The plant has been growing in the open at Elstree in an exposed position, and has remained uninjured although between 20 and 30 degrees of frost were registered on two occasions during the past winter. (Fig. 36.)

Other Exhibits.

Messrs. Allwood, Hayward's Heath: Carnations.
Messrs. Barr, Covent Garden: hardy bulbous plants.

Fig. 36.—Ribes laurifolium. (*Garden.*)

Mr. B. E. Bell, Guernsey: Carnations.
Mr. J. Box, Lindfield: hardy flowers.
Messrs. Brooks, Basingstoke: Primulas.
Messrs. Clark, Dover: hardy plants.
Messrs. Cheal, Crawley: rockwork.
Messrs. Cuthbert, Southgate: forced shrubs.
Mrs. Denison, Berkhampstead: *Primula malacoides rosea.*
Mr. Elliott, Stevenage: alpines.
Mr. Engelmann, Saffron Walden: Carnations.

Guildford Hardy Plant Nursery, Guildford: hardy plants.
Mr. Hemsley, Crawley: alpines.
Misses Hopkins, Shepperton: hardy plants.
Messrs. Mount, Canterbury: Roses.
Messrs. Peed, Mitcham: alpines.
Mr. Prichard, Christchurch: hardy plants.
Mr. Pulham, Elsenham: rock plants.
Messrs. Ware, Feltham: alpines.
Messrs. Wells, Merstham: Carnations.
Messrs. Whitelegg & Page, Chislehurst: Primulas and alpines.
Messrs. Young, Cheltenham: Carnations.

Floral Committee, March 5, 1912.

Mr. H. B. May, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Carter, Raynes Park, for a spring bulb garden.
To Messrs. Veitch, Chelsea, for Azaleas and greenhouse plants.

Silver-gilt Banksian Medal.

To Mr. L. R. Russell, Richmond, for Azaleas.
To Messrs. Sutton, Reading, for Hyacinths.

Silver Flora Medal.

To Mr. H. Burnett, Guernsey, for Carnations.
To Messrs. Cutbush, Highgate, for Carnations, Hyacinths, &c.
To Messrs. W. Paul, Waltham Cross, for flowering Peaches, Almonds, and Camellias.

Silver Banksian Medal.

To Messrs. Barr, Covent Garden, for hardy bulbous plants.
To Adeline Duchess of Bedford (gr. Mr. J. Dickson), Chenies, Rickmansworth, for Primulas.
To Mr. C. Elliott, Stevenage, for alpines.
To Messrs. May, Upper Edmonton, for Clematis and ferns.

Bronze Flora Medal.

To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Messrs. Low, Bush Hill Park, for Carnations, &c.

Award of Merit.

To Azalea 'Blushing Bride' (votes, 15 for), from Messrs Veitch, Chelsea. This charming free-flowering variety is a sport from *Azalea Vervaeniana*. The plant is of good habit and has tough foliage. The flowers are double and measure 3 inches across. They are of a delicate pink colour and are particularly pretty in the bud state. (Fig. 41.)

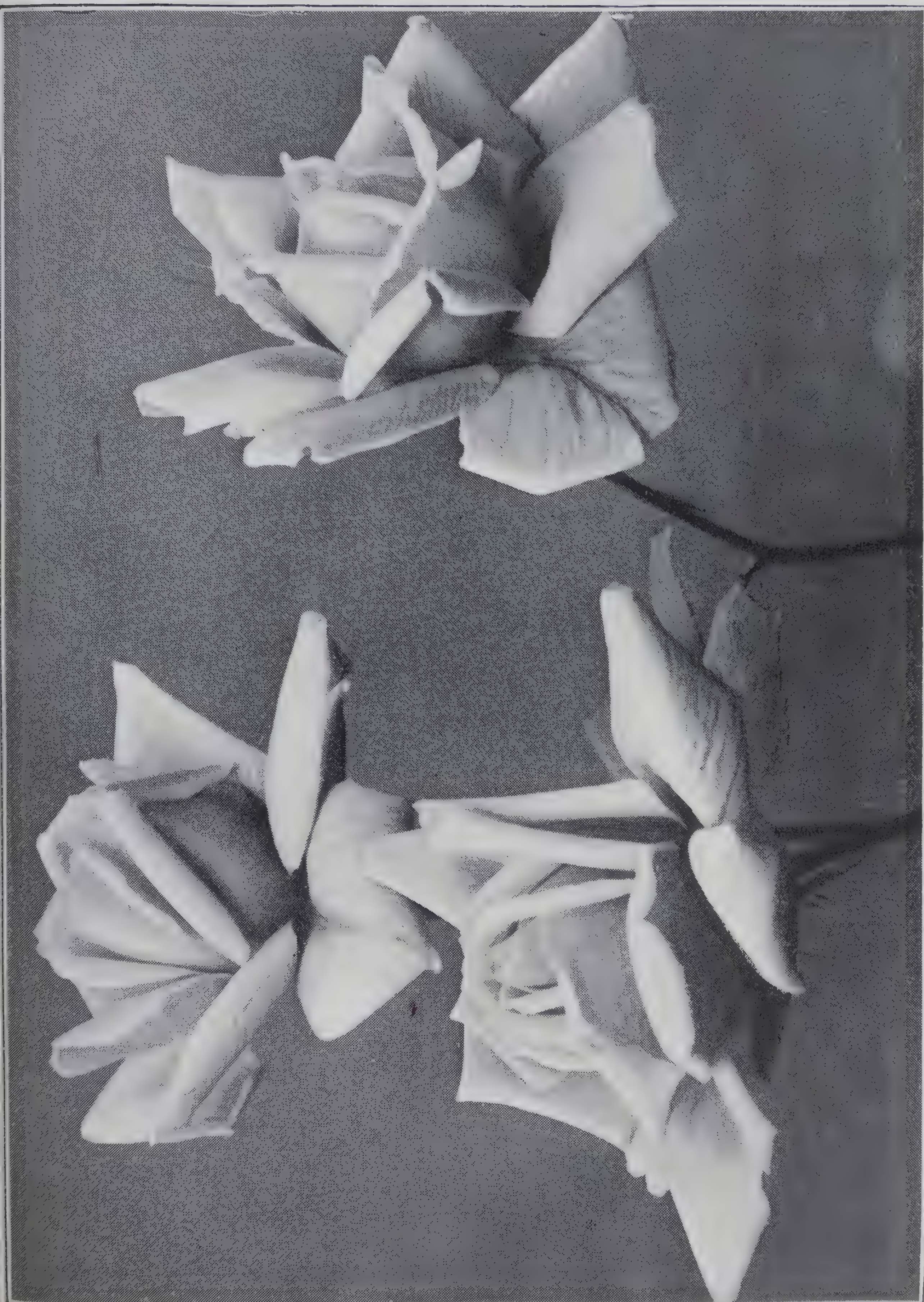

FIG. 38. CAMELLIA CUSPIDATA. (*Veitch.*) (p. [illegible])


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FIG. 40. PRIMULA JULIAE. (*Gardeners' Chronicle.*) (p. lxii.)

To *Corylopsis warleyensis* (votes, unanimous), from Miss Willmott, V.M.H., F.L.S. (gr. Mr. C. R. Fielder, V.M.H.), Warley Place, Great Warley. A very graceful hardy shrub, introduced from China by Mr. E. H. Wilson, V.M.H. The flowers appear before the leaves and are borne in numerous pendulous racemes about 2 inches in length. Each flower is about $\frac{3}{8}$ inch in diameter and is pale-green in colour. Ovate bracts of a similar shade, covered with silky hairs on the concave side, sheath each flower. The habit of the plant resembles that of the Hazel and the flowers have a very pleasant scent.

To *Pteris Parkeri* (votes, unanimous), from Messrs. Parker, Oak-

FIG. 41.—AZALEA 'BLUSHING BRIDE.' (*Veitch.*) (p. lvi.)

leigh Road, Whetstone, London, N. This most useful and beautiful fern has apparently been raised from spores of *P. serrulata*. It is of a deep-green colour, and is especially noticeable for the breadth of its pinnæ, which generally measure about $1\frac{1}{2}$ inches across and 6 inches long. They are serrated at the margins and slightly crinkled.

To Rhododendron 'Cornubia' (votes, 15 for, 1 against), from Messrs. Gill, Penryn, Cornwall. This plant is said to be a cross between *R. Shilsonii* and *R. arboreum.* The flowers are freely produced in large trusses and are of a deep-red colour. They are bell-shaped and measure about $2\frac{1}{2}$ inches across.

Other Exhibits.

Mr. A. W. Abbott, Hungerford: Pelargonium 'Abbott's Sport.'
Messrs. Allwood, Hayward's Heath: Carnations.
Miss Armitage, Ross: *Iris Fosteriana.*
Messrs. Bakers, Codsall: alpines.
Mr. B. E. Bell, Guernsey: Carnations.
Mr. J. Box, Lindfield: hardy plants.
Mr. H. Brotherston, Knebworth: Freesias.
Burton Hardy Plant Nurseries, Christchurch: Alpines.
Mr. L. H. Calcutt, Enfield: spring bulbs.
Messrs. Cannell, Swanley: Pelargoniums, Cinerarias, Begonias, &c.
Messrs. Clark, Dover: hardy plants.
Mr. H. N. Ellison, West Bromwich: Gerberas and Freesias.
Guildford Hardy Plant Nursery, Guildford: hardy plants.
Sir Henry Hoare, Zeals, Wilts.: Violet 'Princess of Wales,' **A.M.** October 15, 1895.
Misses Hopkins, Shepperton: hardy plants.
Mr. T. Pateman, Welwyn: Cyclamen 'Node Seedling.'
Messrs. G. Paul, Cheshunt: Lilacs.
Messrs. Peed, Mitcham: Lachenalias and alpines.
Mr. M. Prichard, Christchurch: hardy plants.
Mr. H. C. Pulham, Stansted: alpines, bulbous plants and rare shrubs.
Messrs. Sydenham, Birmingham: Lily-of-the-Valley, &c.
Messrs. Thompson and Charman, Bushey: alpines.
Messrs. Wallace, Colchester: hardy plants.
Messrs. Ware, Feltham: alpines, &c.
Messrs. Wells, Merstham: Carnations.
Messrs. Whitelegg and Page, Chislehurst: hardy plants.
Messrs. Young, Cheltenham: Carnations, &c.

Floral Committee, March 19, 1912.

Mr. H. B. May, V.M.H., in the Chair, and twenty-seven members present.

Awards Recommended:—

Gold Medal.

To Messrs. Veitch, Chelsea, for Cyclamen, greenhouse plants and forced shrubs.

Silver-gilt Banksian Medal.

To Messrs. Cutbush, Highgate, for Carnations and flowering shrubs, &c.

To Messrs. Hill, Lower Edmonton, for ferns.

Silver Flora Medal.

To Mr. M. Prichard, Christchurch, for hardy plants.

To Mr. L. R. Russell, Richmond, for flowering shrubs and alpines.

Silver Banksian Medal.

To Mr. H. Burnett, Guernsey, for Carnations.

To Messrs. Cannell, Swanley, for Pelargoniums.

To Messrs. Gill, Falmouth, for Rhododendrons.

To Messrs. Low, Bush Hill Park, for Carnations and greenhouse plants.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

To Miss Ough, Streatham Common, for floral paintings.

Bronze Flora Medal.

To Mr. J. Box, Lindfield, for hardy plants.

Bronze Banksian Medal.

To Mrs. Charrington (gr. Mr. Hawthorn), Byfleet, for Cyclamen.

To Messrs. Cheal, Crawley, for rock garden.

To Messrs. Cuthbert, Southgate, for forced shrubs.

To Lady Holland (gr. Mr. Goldstone), Royston, for Amaryllis.

To Mr. G. Reuthe, Keston, for hardy plants.

To Messrs. Ware, Feltham, for rock garden.

Award of Merit.

To *Abies Douglasii Fletcheriana* (votes, 17 for, 3 against), from Messrs. Fletcher Bros., Ottershaw, Chertsey. A very remarkable dwarf conifer, raised from seed of *A. Douglasii.* The tree, which is sixteen years old, is not more than a foot in height, and the growth, which is very dense, forms a neat roundish head about 12 inches across. The foliage is similar in colour and shape to that of its parent, but much smaller. The slow growth and compact dwarf habit should render it a very useful tree for the rock garden.

To *Corylopsis Veitchiana* (votes, 18 for), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree. A new shrub introduced from China by Mr. E. H. Wilson, V.M.H. The seed was sown in the spring of 1908. The plant is of erect and symmetrical growth, and the pendulous racemes of greenish flowers are about 2 inches in length and are borne more freely than on *C. spicata.* The sheathing bracts are almost of the same greenish colour. The brown anthers give a pleasing touch of colour to the flowers, which open before the foliage develops. (Fig. 42.)

To Hippeastrum ' Musigny ' (votes, unanimous), from Lord Rothschild, Tring. A magnificent deep-crimson variety with stiff segments. The plant exhibited carried four flowers on a scape.

To Hippeastrum ' Rose du Barry ' (votes, unanimous), from Lord Rothschild, Tring. This variety has very large flowers measuring 6 inches across. They are of excellent shape and of a charming and uncommon shade of very bright rose. The scape on the plant shown carried four blooms.

To *Primula Knuthiana* (votes, unanimous), from Messrs. Veitch, Chelsea. A new hardy species collected by Mr. W. Purdom on the mountains of Tai-pei-Shan, in the province of Shensi, North China.

The plant grows from $3\frac{1}{2}$ to 4 inches high and carries roundish, many-flowered heads of small bluish-lilac flowers after the manner of *P. capitata.* The foliage and the calyx are mealy as in *P. farinosa.* (Fig. 34.)

To *Prunus Pissardi Moseri flore pleno* (votes, 23 for), from Messrs. Veitch, Chelsea. A most useful flowering tree having large quantities of semi-double peach-blossom flowers appearing before the foliage.

FIG. 42.—CORYLOPSIS VEITCHIANA. (*Garden.*) (p. lix.)

The sprays exhibited were cut from the open ground, thus denoting the valuable early flowering character of this tree.

To Rose 'Rose Queen' (votes, 19 for), from Mr. W. E. Wallace, Eaton Bray, Dunstable. A new H. T. Rose of good size and shape with curled petals of a rosy-pink colour. It has a delicate and pleasing perfume and is evidently an excellent variety for forcing. (Fig. 37.)

Cultural Commendation.

To Mr. T. Lamb, Bingham, Notts., for an exceptionally well-grown Cyclamen.

Other Exhibits.

Messrs. Allwood, Hayward's Heath: Carnations.
Messrs. Artindale, Sheffield: Primulas.
Messrs. Bakers, Codsall: hardy plants.
Messrs. Barr, Covent Garden: *Lathyrus cyaneus.*
Miss Bunyard, Maidstone: Iris paintings.
Burton Hardy Plant Nurseries, Christchurch: hardy plants.
Messrs. Clark, Dover: hardy plants.
Mr. C. Elliott, Stevenage: rock plants.
Guildford Hardy Plant Nursery, Guildford: hardy plants.
Misses Hopkins, Shepperton: hardy plants.
Messrs. Jarman, Chard: Cinerarias.
Messrs. Jones, Lewisham: Pelargoniums.
Mr. J. MacDonald, Harpenden: grasses.
Miss Mangles, Farnham: Rhododendrons.
T. Moore, Esq., Broxton: Carnation.
Messrs. Mount, Canterbury: Roses.
Messrs. Peed, Streatham: rock plants.
Mr. R. Prichard, West Moors: alpines.
Mr. G. Prince, Oxford: Roses.
Messrs. Sydenham, Birmingham: Lilies, Lily-of-the-Valley, &c.
Mrs. Thatcher, Chew Magna: Anthurium.
Messrs. Thompson and Charman, Bushey: alpines.
Royal Tottenham Nurseries, Ltd., Dedemsvaart: *Anemone Pulsatilla rosea* 'Mrs. Vanderelst.'
Messrs. Wells, Merstham: Carnations.
Messrs. Whitelegg & Page, Chislehurst: hardy plants.
Messrs. Young, Cheltenham: Carnations.

FLORAL COMMITTEE, APRIL 2, 1912.

Mr. G. PAUL, J.P., V.M.H., in the Chair, and twenty-six members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. Cuthbert, Southgate, for forced shrubs and Lachenalias.

Silver Flora Medal.

To Messrs. Cutbush, Highgate, for Carnations, &c.
To Messrs. Gill, Falmouth, for Rhododendrons.
To Messrs. Mount, Canterbury, for Roses.
To Messrs. Piper, Bayswater, for shrubs and flowering plants.

To Mr. L. R. Russell, Richmond, for Clematis, &c.
To Messrs. Veitch, Chelsea, for Cinerarias and Primulas.

Silver Banksian Medal.

To Mr. H. Burnett, Guernsey, for Carnations.
To Messrs. Cannell, Swanley, for Pelargoniums.
To Messrs. F. Cant, Colchester, for Roses.
To Messrs. Jackman, Woking, for hardy plants.
To Messrs. Jones, Lewisham, for Pelargoniums.
To Messrs. W. Paul, Waltham Cross, for flowering shrubs.
To Mr. M. Prichard, Christchurch, for hardy plants.
To Mr. G. Prince, Longworth, for Roses.
To Mr. G. Reuthe, Keston, for hardy plants.
To Messrs. Ware, Feltham, for a rockery.
To Messrs. Young, Cheltenham, for Carnations.

Bronze Flora Medal.

To Messrs. Felton, Hanover Square, for Lilacs.
To Messrs. Whitelegg & Page, Chislehurst, for hardy plants.

Award of Merit.

To *Camellia cuspidata* (votes, unanimous), from Messrs. J. Veitch, Chelsea. A very handsome hardy evergreen shrub, introduced from China by Mr. E. H. Wilson, V.M.H. The pure white single flowers are produced in great abundance, and measure about 2 inches across. The leaves are smooth, ovate-lanceolate, serrated, and dark green. (Fig. 38.)

To Pelargonium 'Ambrosea' (votes, 14 for), from Mr. P. Ladds, Swanley. A very useful free-flowering variety of good habit. The flowers are exceptionally large and of a pleasing rose-pink colour with white centres. (Fig. 39.)

To *Primula Juliae* (votes, unanimous), from Mr. W. G. Baker, Botanic Garden, Oxford. This very interesting and rare Caucasian Primula is quite hardy in this country, and has deep rosy-lilac flowers. It is very free-flowering, and has small cordate leaves with crenated margins. The plant is of tufted growth. Introduced from Jurjen, August, 1910. (Fig. 40.)

To Primula 'Mrs. James Douglas' (votes, 14 for, 1 against), from Mr. J. Douglas, Great Bookham. A delightful new Primula somewhat resembling *P. intermedia* in habit and foliage. The flowers are of a lovely deep shade of mauve, and measure over 1 inch across. They have a pale yellow centre and are borne in a many-flowered bunch.

To *Primula warleyensis* (votes, 19 for), from Miss Willmott, V.M.H., F.L.S. (gr. Mr. C. R. Fielder, V.M.H.), Warley Place, Great Warley, Essex. This is a very pretty little Primula, collected in China by Mr. E. H. Wilson, V.M.H. It grows about 2½ inches high and has rosy-lilac flowers measuring 1½ inch across, with orange-brown centres. The calyx and the flower-stem are mealy. The latter usually carries four flowers. The leaves are small, ovate,

and the under sides are covered with pale yellow farina. It is not yet certain whether it will prove hardy in this country.

To Rose 'Mrs. E. Alford' (votes, 20 for, 3 against), from Messrs. Lowe & Shawyer, Uxbridge. A large rose-pink H.T. variety of good form, with recurved petals and little scent. It is intermediate between 'Madame Abel Chatenay' and 'La France,' and forces well.

To Rose 'Mrs. C. Reed' (votes, 19 for, 3 against), from Messrs. Lowe & Shawyer, Uxbridge. An excellent H.T. variety of good size and shape. It is of a charming cream colour suffused with delicate pink, and has a pleasing perfume. The buds are particularly pretty It is a good grower, and should prove useful for forcing. (Fig. 43.)

To *Viburnum Davidii* (votes, unanimous), from Messrs. J. Veitch, Chelsea. A perfectly hardy dwarf evergreen shrub, collected in China by Mr. E. H. Wilson, V.M.H. The small white flowers are very fragrant, and are borne in flat corymbs. The dark green leaves are ovate in shape and very handsome. Owing to its compact and neat habit this plant should prove useful for the rockery. (Fig. 44.)

Other Exhibits.

Messrs. Allwood, Hayward's Heath: Carnations.

Messrs. Bakers, Codsall: hardy plants.

Mr. J. Box, Lindfield: hardy plants.

Lord Richard Cavendish, Holker Hall, Lancs.: *Rhododendron arboreum* 'Holker Hall' var.

Messrs. Cheal, Crawley: flowering and foliage shrubs.

C. S. Gordon Clark, Esq., Leatherhead: *Brunfelsia calycina.*

Mr. A. F. Dutton, Iver: Carnation 'Mrs. A. F. Dutton.'

Mr. C. Engelmann, Saffron Walden: Carnations.

Messrs. Fells, Hitchin: hardy plants.

Hon. Vicary Gibbs, Elstree: *Exochorda Giraldii.*

Guildford Hardy Plant Nursery, Guildford: hardy plants.

Misses Hopkins, Shepperton: hardy plants.

Messrs. Low, Bush Hill Park: Carnations, &c.

Messrs. May, Upper Edmonton: Ferns and flowering plants.

Messrs. Peed, Mitcham: rockery.

Mrs. Henry Stevenson, Stoke Poges: *Anemone fulgens* 'Hedgerley.'

Messrs. Thompson & Charman, Bushey: alpines.

Messrs. Wallace, Colchester: alpines, &c.

Messrs. Wells, Merstham: Carnations.

FLORAL COMMITTEE, APRIL 16, 1912.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Cutbush, Highgate, for forced plants, Carnations and alpines.

Silver Flora Medal.

To Mr. H. Burnett, Guernsey, for Carnations.

To Mr. J. Douglas, Great Bookham, for Auriculas.

To Messrs. May, Upper Edmonton, for ferns.

To Messrs. Pipers, Bayswater, for rock garden.

Silver Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. Gill, Falmouth, for Rhododendrons.

To Messrs. Mount, Canterbury, for Roses.

To Messrs. W. Paul, Waltham Cross, for Roses.

To Mr. M. Prichard, Christchurch, for hardy plants.

To Messrs. T. S. Ware, Feltham, for rock garden.

Bronze Banksian Medal.

To Messrs. Cannell, Swanley, for Pelargoniums.

To Messrs. Cheal, Crawley, for rockery and shrubs.

To Mr. Day, Sutton Scotney, for Spanish Iris.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

To Messrs. Jackman, Woking, for hardy plants.

To Messrs. Jones, Lewisham, for Pelargoniums.

To Mrs. Lloyd Edwards, Bryn Oerog, near Llangollen, for Saxifrages and Aubrietias.

To Mr. G. Prince, Longworth, for Roses.

To Messrs. Whitelegg & Page, Chislehurst, for hardy plants.

Award of Merit.

To Auricula 'Roxburgh' (votes, 15 for), from Mr. J. Douglas, Great Bookham, Surrey. A beautiful variety of the alpine section, having very large deep violet-purple flowers, with a pale yellow centre.

To Carnation 'Wodenethe' (votes, unanimous), from Messrs. Wells, Merstham. A very free-flowering Tree Carnation, having large pure white flowers borne on strong, stiff stems. The calyx is non-bursting, and the blooms are very full and have a most pleasing sweet clove perfume. (Fig. 45.)

To *Cineraria hybrida* (votes, 15 for, 2 against), from Messrs. J. Veitch, Chelsea. This is the result of a cross between *Cineraria cruenta* and *Senecio tussilaginis*. The influence of the latter parent is seen in the foliage. The flowers are white, tinged with blue, and the centre is of deep blue. The habit of the plant is bushy, and particularly suitable for pot work. (Fig. 46.)

To *Freesia Tubergenii* 'Le Phare' (votes, 16 for), from Mr. C. G. van Tubergen, jun., Haarlem, Holland. A charming pure mauve variety, with a white throat and bright orange patches on the lower segments of the perianth. It has a very sweet fragrance. (Fig. 47.)

Other Exhibits.

Messrs. Allwood, Hayward's Heath: Carnations.

Messrs. Barr, Covent Garden: alpines.

Mr. B. E. Bell, Guernsey: Carnations.
W. B. M. Bird, Esq., Chichester: Amaryllis.
Mr. J. Box, Lindfield: hardy plants.
Burton Hardy Plant Nursery, Christchurch: hardy plants.
Mr. O. Darvill, Beckington: *Anemone nemorosa* var.
Messrs. Clark, Dover: hardy plants.
Messrs. Cuthbert, Southgate: *Azalea Maxwellii.*
Mr. C. Elliott, Stevenage: alpines.

FIG. 46.—CINERARIA HYBRIDA. (*Veitch.*) (p. lxiv.)

Mr. H. L. Ellison, West Bromwich: Gerberas.
Messrs. Fells, Hitchin: hardy plants.
Mr. L. Greening, Richmond Hill: rockery.
Guildford Hardy Plant Nursery, Guildford: hardy plants.
Mrs. Hay, Christchurch: *Viola gracilis* var.
Mrs. Henderson, Horsham: *Echium* 'Pride of Madeira.'
Misses Hopkins, Shepperton: hardy plants.
Mr. T. Kitley, Bath: Saxifrages.

Mr. P. Ladds, Swanley: Pelargoniums.
Messrs. Ladhams, Southampton: Polyanthus.
Messrs. Low, Bush Hill Park: Carnations, &c.
Messrs. Peed, Mitcham: rockery.
Hon. H. B. Portman, Uckfield: Schizanthus.
Mr. R. Prichard, West Moors: hardy plants.
Mr. G. Reuthe, Keston: flowering shrubs and alpines.
Mr. V. Slade, Taunton: Pelargoniums.
Messrs. Veitch, Chelsea: greenhouse plants.
Mr. W. A. Watts, St. Asaph: Auriculas.

Floral Committee, April 30, 1912.

Mr. H. B. May, V.M.H., in the Chair, and twenty-two members present.

Awards Recommended :—

Gold Medal.

To Messrs. Mount, Canterbury, for Roses.

Silver-gilt Banksian Medal.

To Messrs. Cutbush, Highgate, for Carnations and flowering plants.
To Messrs. Piper, Bayswater, for walled and paved garden.

Silver Flora Medal.

To Messrs. Dobbie, Edinburgh, for Sweet Peas.
To Messrs. Lloyd Edwards, Llangollen, for Saxifrages.
To Messrs. May, Upper Edmonton, for flowering plants.
To Messrs. Waterer, Bagshot, for Rhododendron 'Pink Pearl.'

Silver Banksian Medal.

To Mr. C. W. Breadmore, Winchester, for Sweet Peas.
To Mr. H. Burnett, Guernsey, for Carnations.
To Messrs. F. Cant, Colchester, for Roses.
To Mr. C. Elliott, Stevenage, for alpines.
To Mr. C. Engelmann, Saffron Walden, for Carnations.
To Messrs. W. Paul, Waltham Cross, for Roses.
To Messrs. Peed, West Norwood, for Caladiums, Gloxinias, Streptocarpus, and alpines.
To Messrs. Veitch, Chelsea, for Cinerarias.

Bronze Banksian Medal.

To Messrs. Barr, Covent Garden, for rockery.
To Messrs. Cannell, Swanley, for Pelargoniums.
To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Cheal, Crawley, for alpines and shrubs.
To Messrs. Clark, Dover, for hardy plants.
To Mr. M. Prichard, Christchurch, for hardy plants.

Award of Merit.

To *Araucaria excelsa elegantissima aurea* (votes, 11 for), from Messrs. Rochford, Turnford Hall Nurseries, near Broxbourne. A pretty, graceful form of the Norfolk Island Pine. The young growths are golden yellow, and when mature they assume a pale green shade much lighter than in the type. (Fig. 49.)

To *Celsia cretica*, 'Cliveden' variety (votes, 16 for), from Waldorf Astor, Esq., M.P. (gr. Mr. W. Camm), Cliveden, Taplow. An excellent variety of this useful hardy biennial. The flowers, which are borne on tall spikes, are very large, numerous, and of a bright yellow colour, with curious reddish-brown markings on the two upper segments. The stems and the under-surfaces of the leaves are hairy.

To *Cheiranthus mutabilis*, Keeley's variety (votes, 9 for, 3 against), from R. Windsor Rickards, Esq., Usk Priory, Monmouthshire. This plant originated in a Devonshire garden, and is very floriferous, bushy, and erect in habit, and of medium height. The flowers are large and deep vinous mauve or purple in colour.

To *Cineraria* 'Pompadour' (strain) (votes, 4 for), from Messrs. Veitch, Chelsea. A most useful strain, of good dwarf, compact habit. The foliage is large, and the flowers vary from white to pale pink in colour, but are all streaked with blue and have blue centres. Some of the largest blooms measured 3 inches across.

To *Deutzia longifolia* (votes, unanimous), from Miss Willmott, V.M.H., F.L.S. (gr. Mr. Fielder, V.M.H.), Warley Place, Great Warley, Essex. A charming hardy shrub introduced from China by Mr. E. H. Wilson, V.M.H. The flowers, which are borne in great profusion, are small, measuring about ½ inch across, and of a pale lilac colour, which contrasts pleasingly with the orange anthers. The leaves are dark green, lanceolate and serrate. This shrub is said to force well, and its flowers remain in good condition for a considerable period.

To *Echium truncatum* (votes, 14 for), from Waldorf Astor, Esq., M.P. (gr. Mr. W. Camm), Cliveden, Taplow, Bucks. A very handsome hardy plant, having large bold spikes covered with small deep blue flowers. The long pink filaments contrast curiously with the blue colour. The leaves on the spike are small, lanceolate, and covered with silky hairs. The length of the spikes exhibited was about 18 inches. (Fig. 50.)

To *Lewisia Howellii* (votes, 12 for), from Mr. M. Prichard, Christchurch. A very useful and beautiful addition to this genus. The flowers are borne freely in umbels and are of a creamy-apricot colour streaked with deep rose. The leaves are produced in rosettes, and are succulent and lanceolate. The margins are prettily crinkled and tinged with pink. The plant exhibited bore ten inflorescences.

To *Saxifraga* × 'Comet' (votes, 7 for), from Mrs. Lloyd Edwards, Bryn Oerog, near Llangollen. This charming plant is the result of crossing *S. granulata* with a good red mossy variety. It has large white flowers borne on stems 9 inches high, which arise from a tuft of vigorous foliage. (Fig. 51.)

To *Saxifraga* × 'Mrs. J. F. Tottenham' (votes, 8 for), from Mrs. Lloyd Edwards, Bryn Oerog, near Llangollen. This pretty Saxifrage is a seedling from a plant obtained from the same cross which produced the variety 'Comet.' It has white flowers, borne on hairy stems 6 inches high, arising from tufts of foliage similar to those of the variety 'Comet.' One of the most pleasing points about this plant is the exquisite pink colouring of the unopened buds. (Fig. 52.)

Other Exhibits.

Messrs. Allwood, Haywards Heath: Carnations.

Miss E. Armitage, Ross: Aubrietias.

Messrs. Bunyard, Maidstone: hardy plants.

Burton Hardy Plant Nurseries, Christchurch: hardy plants.

Messrs. Clibran, Altrincham: Aubrietias.

L. Cumming, Esq., Rugby: *Karatas Carolinae.*

Messrs. Cuthbert, Southgate: Azaleas.

Mr. J. Douglas, Great Bookham: Carnation 'Bookham Pink.'

W. R. Dykes, Esq., M.A., Charterhouse, Godalming: Irises.

R. Farrer, Esq., J.P., Clapham, Yorkshire: *Ranunculus pyrenaeus* 'Rosa Bella.'

Messrs. Fells, Hitchin: hardy plants.

Messrs. Godfrey, Exmouth: Verbenas.

Mr. L. Greening, Richmond: rock garden.

Guildford Hardy Plant Nursery, Guildford: hardy plants.

Mr. P. S. Hayward, Clacton-on-Sea: Violas.

Mr. H. Hemsley, Crawley: hardy plants.

Misses Hopkins, Shepperton: hardy plants.

Messrs. Jackman, Woking: hardy plants.

Messrs. Jones, Lewisham: Pelargoniums.

Mr. P. Ladds, Swanley: Pelargoniums and Stocks.

Messrs. Low, Enfield: greenhouse plants.

Mrs. Mainwaring, St. Asaph: Anemones.

Messrs. Münch & Haufe, Leuben bei Dresden: Rose 'Heinrich Münch.'

Messrs. Parker, Whetstone: *Pteris Parkeri.*

Messrs. Phillips & Taylor, Bracknell: rock plants.

Hon. H. Portman, Uckfield: berries of *Nandina domestica.*

Messrs. Reamsbottom, Geashill: Anemones.

Mr. G. Reuthe, Keston: hardy plants.

H. L. Robson, Esq., Guildford: Stock 'H. L. Robson.'

Messrs. Rogers, Southampton: Rhododendrons, &c.

Mr. L. R. Russell, Richmond: hardy plants.

Mr. A. L. Smith, Catford: Pelargoniums.

Messrs. Sutton, Reading: *Phlox Drummondii erecta* 'Sutton's Purity.'

Messrs. Wells, Merstham: Chrysanthemums.

Messrs. Whitelegg & Page, Chislehurst: hardy plants.

FIG. 47.—FREESIA TUBERGENII 'LE PHARE.' (*van Tubergen.*) (p. lxiv.)

FIG. 48.—CARNATION 'TRIUMPH.' (*Engelmann.*) (p. liii.)

[To face p. lxviii.

FIG. 49.—ARAUCARIA EXCELSA ELEGANTISSIMA AUREA. (Pochford.)
(p. lxvii.)

Fig. 50.—Echium truncatum. (*Gardeners' Chronicle.*) (p. lxvii.)

Fig. 51.—Saxifraga × 'Comet.' (*Edwards.*)

Fig. 52.—Saxifraga × 'Mrs. J. F. Tottenham.' (*Edwards.*)

ORCHID COMMITTEE.

JANUARY 9, 1912.

Mr. J. GURNEY FOWLER in the Chair, and twenty-three members present.

Awards Recommended:—

Silver Flora Medal.

To Messrs. Sander, St. Albans, for a group containing many rare species.

To Messrs. Armstrong & Brown, Tunbridge Wells, for a group of hybrid Cattleyas, Cypripediums, &c.

To Messrs. Jas. Veitch, Chelsea, for a group, chiefly hybrid Cypripediums and *Zygopetalum Mackayi.*

To Messrs. McBean, Cooksbridge, for a group in the centre of which was about twenty *Laelia anceps Schröderae.*

To Messrs. Stuart Low, Bush Hill Park, for a group.

To Messrs. Cypher, Cheltenham, for Cypripediums.

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrids.

To Mr. E. V. Low, Haywards Heath, for a group.

To Sir Jeremiah Colman, Bart. (gr. Mr. Collier), for hybrids and rare species.

Bronze Banksian Medal.

To Messrs. Hassall, Southgate, for hybrid Cattleyas, &c.

First-class Certificate.

To *Laeliocattleya* × *bella alba* (*L. purpurata* × *C. labiata alba*) (votes, unanimous), from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). A remarkably beautiful form with pure white sepals and petals, and crimson-purple lip. The spike bore six flowers. (Fig. 54.)

Award of Merit.

To *Laeliocattleya* × 'Mrs. W. Hopkins' (*L.c.* × *Haroldiana* × *L.* × 'Iona' *nigricans*) (votes, unanimous), from Francis Wellesley, Esq., Westfield (gr. Mr. W. Hopkins). A very fine hybrid. Sepals Indian yellow; petals broad, lighter yellow flecked with rose; lip plain-edged, glowing violet-crimson. (Fig. 55.)

To *Cypripedium* × *San-Actaeus*, Westfield variety (*insigne* 'Harefield Hall' × *Actaeus langleyense*) (votes, unanimous), from Francis Wellesley, Esq. Dorsal sepal pure white with effective purple spotting. Lip and petals broad; yellow, tinged with purple.

To *Cypripedium* × *Hera-Beeckmanii* ('Hera' × *Beeckmanii*) (votes, unanimous), from J. Gurney Fowler, Esq., Glebelands, South Woodford (gr. Mr. J. Davis). A showy hybrid with white dorsal sepal, bearing large claret blotches. Petals and lip yellow, tinged with reddish-brown.

To *Cypripedium* × 'Catiline' ('Mrs. Wm. Mostyn' × 'Leander') (votes, unanimous), from His Grace the Duke of Marlborough, Blenheim (gr. Mr. Hunter). Dorsal sepal approaching that of *C.* × 'Mrs. Wm. Mostyn'; white above and blotched rose-purple in the lower part. Petals and lip honey-yellow, tinged with purple.

To *Cymbidium* × *rosefieldiense* (*grandiflorum* × *Tracyanum*) (votes, unanimous), from de B. Crawshay, Esq., Rosefield, Sevenoaks (gr. Mr. Stables). In form nearest to *C. grandiflorum*. Sepals and petals pale green, with small red spots. Lip cream-white, with brown markings.

To *Odontoglossum crispum* 'Queen of the Morn' (votes, 12 for, 4 against), from Walter Cobb, Esq., Rusper (gr. Mr. C. J. Salter). A large flower, white tinged with lilac colour.

To *Cattleya* × 'Maggie Raphael' *alba*, Orchidhurst variety (*Trianiae alba* × *C. Dowiana*) (votes, 16 for, 1 against), from Messrs. Armstrong & Brown, Tunbridge Wells. A fine white Cattleya with magenta-rose lip, having gold lines from the base.

Cultural Commendation.

To Mr. Collier, gr. to Sir Jeremiah Colman, Bart., for an immense specimen of *Dendrobium speciosum nitidium*.

Other Exhibits.

Lieut.-Col. Sir George L. Holford, K.C.V.O. (gr. Mr. Alexander): three new hybrids.

F. J. Hanbury, Esq.: *Cypripedium* ×.

G. Hanbury, Esq.: *Calanthe vestita*.

Earl Stanhope: *Calanthe* ×.

Orchid Committee, January 23, 1912.

Mr. J. Gurney Fowler in the Chair, and twenty members present.

Awards Recommended:—

Lindley Medal.

To Lieut.-Col. Sir George L. Holford, K.C.V.O., Westonbirt (gr. Mr. H. G. Alexander), for a group of fine specimen orchids.

Silver Flora Medal.

To Sir Jeremiah Colman, Bart., V.M.H. (gr. Mr. Collier), for varieties of *Laelia anceps*.

To Messrs. Charlesworth, for hybrids.

To Messrs. Sander, for a group.

FIG. 53.—CYPRIPEDIUM × 'NORA.' (*Gardeners' M*

To Messrs. Armstrong & Brown, for hybrid Cattleyas and Cypripediums.

To Messrs. Stuart Low, for a group.

To Messrs. Jas. Cypher, for Cypripediums.

Silver Banksian Medal.

To Messrs. McBean, for a group.

To Mr. E. V. Low, for a group.

First-class Certificate.

To *Cypripedium* × 'Nora' ('Mons. de Curte' × *aureum* 'Oedippe') (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O. Flower of fine shape. Dorsal sepal bearing heavy, feathered lines of deep rose-purple. Margin white. Petals and lip yellow, tinged and marked with purple. (Fig. 53.)

Award of Merit.

To *Cypripedium* × 'Duke of Marlborough' (parentage unrecorded) (votes, 15 for, 3 against), from His Grace the Duke of Marlborough (gr. Mr. Hunter). Dorsal sepal white with a central purple band, and purple spotting at the base. Petals and lip light yellow, tinged with purple.

To *Cymbidium* × *Schlegeli* (*insigne* × *Wiganianum*) (votes, unanimous), from Messrs. McBean. Sepals and petals cream-white, slightly spotted with purple. Lip white, blotched with red.

To *Zygopetalum Mackayi Charlesworthii* (votes, unanimous), from Messrs. Charlesworth. An albino with pale green sepals and petals and large pure white lip.

To *Laeliocattleya* × *amabilis* (*L.* × *Fascinator* × *C. Luddemanniana Stanleyi*) (votes, 10 for, 5 against), from Messrs. Charlesworth. Flowers white with purple veining on the lip.

To *Zygocolax* × *Charlesworthii*, Cobb's variety (*C. jugosus* × *Z.* × *Perrenoudii*) (votes, unanimous), from Walter Cobb, Esq., Rusper (gr. Mr. C. J. Salter). Flowers larger than the original, white heavily blotched with violet.

Other Exhibits.

Sir Trevor Lawrence, Bart., K.C.V.O.: *Zygopetalum brachypetalum.*

de B. Crawshay, Esq. (gr. Mr. Stables): hybrids.

Sir Julius Wernher: *Calanthe* × 'Vulcan.'

Sir Wm. Marriott: hybrid *Laeliocattleya.*

C. J. Phillips, Esq.: *Cymbidium Pauwelsii.*

Messrs. Jas. Veitch: hybrid Odontoglossums.

Pantia Ralli, Esq.: white *Cattleya Trianiae.*

Francis Wellesley, Esq.: hybrid Cypripediums.

Messrs. Hassall: a group.

H. S. Goodson, Esq.: rare orchids.

ORCHID COMMITTEE, FEBRUARY 6, 1912.

MR. J. GURNEY FOWLER in the Chair, and eighteen members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. W. Baylor Hartland, Cork, for Odontoglossums and Cypripediums.

Silver Banksian Medal.

To Messrs. Charlesworth, for a group.
To Messrs. J. Cypher, for Cypripediums.
To Messrs. McBean, for a group.
To Messrs. Stuart Low, for a group.

First-class Certificate.

To *Odontoglossum* × 'Merlin' (parentage unrecorded) (votes, 15 for, 2 against), from Lieut.-Col. Sir George L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander). Flowers closely approaching the best blotched forms of *Odontoglossum crispum*; white, with about ten rose-purple blotches on the sepals, and one large irregular blotch, and some smaller ones of a darker shade on the petals; lip white with yellow crest and some rose-purple blotches. (Fig. 56.)

Award of Merit.

To *Odontoglossum* × 'Memoria Lily Neumann' (parentage unrecorded) (votes, unanimous), from J. Gurney Fowler, Esq. (gr. Mr. J. Davis). A beautiful hybrid with the inner two-thirds of the sepals and petals deep claret-purple, with slight white lines, and white tips tinged with rose. Lip white with some dark-purple blotches in front of the yellow crest.

Other Exhibits.

Lieut.-Col. Sir George L. Holford, K.C.V.O.: hybrids.
Sir Jeremiah Colman, Bart, V.M.H.: *Odontoglossum* × *Collierii* ('Phoebe' × *ardentissimum*).
Francis Wellesley, Esq.: hybrids.
J. Gurney Fowler, Esq.: *Odontoglossum crispum* 'Olive.'
Mr. W. A. Manda, St. Albans: four varieties of *Cattleya Trianiae*.
Messrs. Hassall: Cypripediums.
Mr. Tracy, Twickenham: *Oncidium anthocrene*.

ORCHID COMMITTEE, FEBRUARY 20, 1912.

MR. J. GURNEY FOWLER in the Chair, and twenty members present.

Awards Recommended :—

Gold Medal.

To Lieut.-Col. Sir George L. Holford, K.C.V.O., Westonbirt (gr. Mr. H. G. Alexander), for a very fine group.

FIG. 54.—LAELIOCATTLEYA × BELLA ALBA. (*Gardeners' Magazine.*)

FIG. 55.—L.C. × 'MRS. W. HOPKINS.' (p. lxix.)

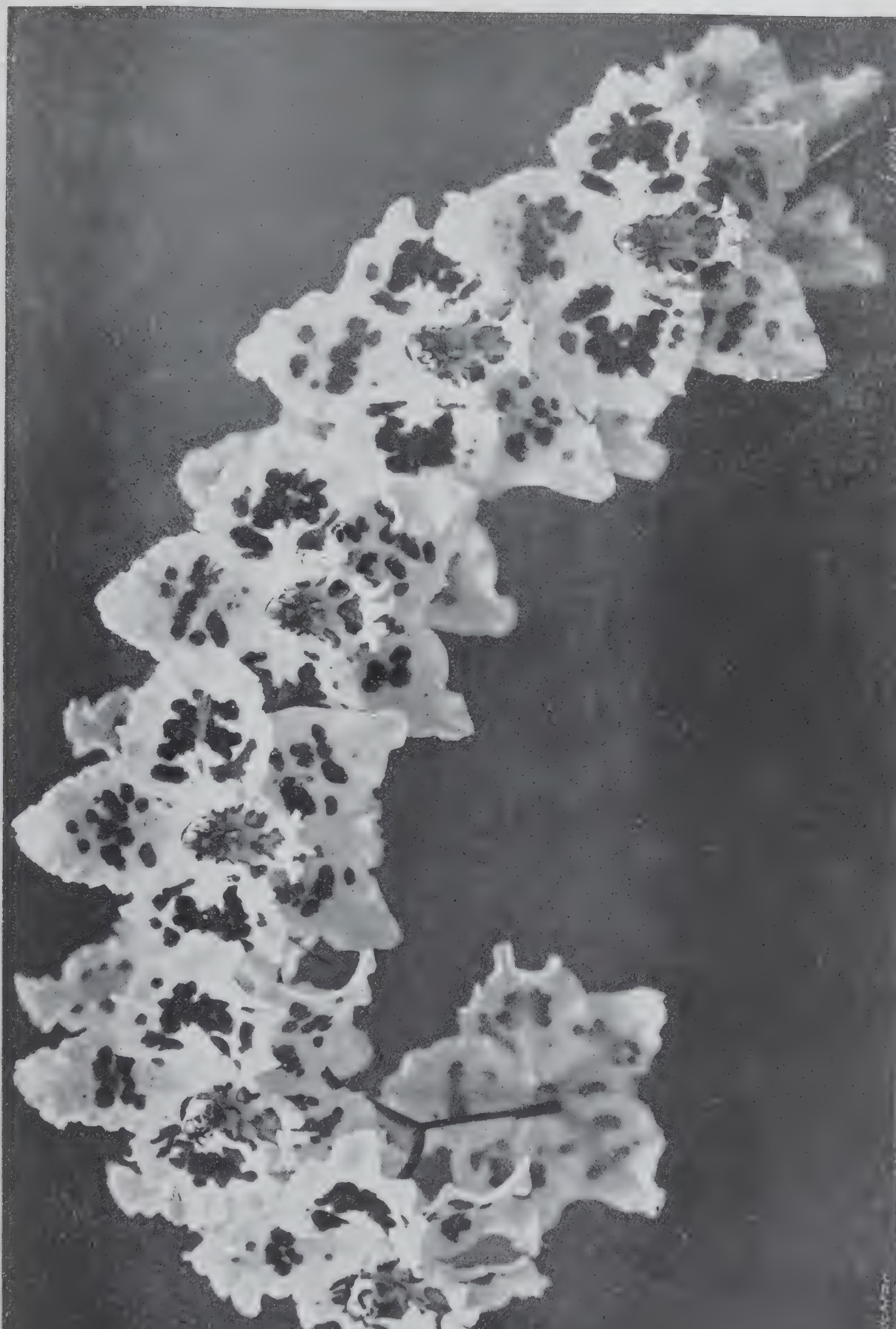


Fig. 57.—Odontoglossum crispum 'Samuel Gratrix.' (*Gardeners' Chronicle.*)
(p. lxxv.)

Silver-gilt Flora Medal.

To Messrs. Charlesworth, for hybrids and rare species.

Silver Flora Medal.

To Messrs. Armstrong & Brown, for hybrids, &c.
To Messrs. J. Cypher, for Cypripediums.
To Messrs. Stuart Low, for a group.
To Messrs. Sander, for a group.
To Messrs. McBean, for white *Laelia anceps* and Odontoglossums.

Silver Banksian Medal.

To Sir Julius Wernher, Bart., for Calanthes.
To Mr. E. V. Low, for a group.
To Messrs. Mansell and Hatcher, for a group.

Award of Merit.

To *Cattleya* × 'Brenda' (*Dusseldorfei* 'Undine' × *Gaskelliana alba*) (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O. Flowers pure white with primrose disc to the lip.

To *Calanthe* × 'Baron Schröder' var. *albiflora* (*vestita rubro-oculata gigantea* × *Regnieri*) (votes, unanimous), from Baron Bruno Schröder (gr. Mr. J. E. Shill). Sepals and petals white, lip rose-pink with purple eye.

To *Odontoglossum* × 'Vulcan' *Crawshayanum* (*crispum* × *Vuylstekei*) (votes, unanimous), from de B. Crawshay, Esq. (gr. Mr. Stables). Flowers large, pale yellow, with red-brown blotches.

Cultural Commendation.

To Mr. F. J. Thorne (gr. to Mrs. W. J. Joicey, Sunningdale Park), for a fine specimen of *Lycaste* × *Balliae* with over thirty flowers.

Other Exhibits.

Sir Jeremiah Colman, Bart., V.M.H.: hybrid Dendrobiums, &c.
F. Ducane Godman, Esq.: *Odontoglossum Godmanii.*
Walter Cobb, Esq.: hybrids.
The Hon. Lady Neeld: *Odontoglossum* hybrid.
de B. Crawshay, Esq.: Odontoglossums.
W. H. St. Quintin: white *Dendrobium* × 'Cybele.'
H. Jennings, Esq.: *Cypripedium* ×.
Mr. Tracy: *Odontoglossum Pescatorei Floryi.*
Mr. W. A. Manda: *Cattleya Trianiae* varieties.

ORCHID COMMITTEE, MARCH 5, 1912.

Mr. J. GURNEY FOWLER in the Chair, and twenty-three members present.

Awards Recommended:—

Gold Medal.

To Lieut.-Col. Sir George L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander), for a magnificent group of *Cattleya Trianiae*, and showy hybrids.

Silver-gilt Flora Medal.

To Messrs. Armstrong & Brown, for Dendrobiums and other Orchids.

Silver Flora Medal.

To Messrs. Jas. Veitch, for Odontoglossums, Cypripediums, &c.

Silver Banksian Medal.

To Sir Jeremiah Colman, Bart, V.M.H., for hybrid Dendrobiums.

To Messrs. Sander, for a varied group.

To Messrs. J. Cypher, for Cypripediums, Masdevallias, &c.

To Messrs. Stuart Low, for a group.

To Messrs. Hassall, for a group of *Angraecum sesquipedale*, &c.

Award of Merit.

To *Odontoglossum* × 'Jasper' (*crispum* × *amabile*) (votes, unanimous), from J. S. Moss, Esq., Wintershill, Bishop's Waltham (gr. Mr. Kench). Flowers pale pink evenly spotted with red-brown.

To *Dendrobium* 'Golden Ray' *superbum* ('Othello' *Colmanae* × *signatum aureum*) (votes, unanimous), from Sir Jeremiah Colman, Bart. Flowers bright yellow, tinged with rose on the outer parts of the sepals and petals. Disc of the lip claret colour.

Cultural Commendation.

To Mr. J. Carpenter (gr. to Fred. C. Stoop, Esq., West Hall, Byfleet), for *Angraecum sesquipedale*, with seventeen flowers.

To Mr. Collier (gr. to Sir Jeremiah Colman, Bart.), for *Cymbidium grandiflorum*.

Other Exhibits.

The Duke of Marlborough: hybrid Cattleya.

Sir Trevor Lawrence, Bart.: *Cymbidium* × *Colmanae*, Edenside variety.

The Comte de Hemptinne: *Cattleya Trianiae alba* 'Edelweiss.'

The Hon. Lady Neeld: Odontoglossums.

Messrs. Charlesworth: a group.

Messrs. W. Baylor Hartland: a group.

J. Gurney Fowler, Esq.: *Cattleya Schröderae* 'Louisa.'

Messrs. McBean: a group.

F. M. Ogilvie, Esq.: hybrids.

ORCHID COMMITTEE, MARCH 19, 1912.

Mr. J. GURNEY FOWLER in the Chair, and eighteen members present.

Awards Recommended:—

Silver Flora Medal.

To H. S. Goodson, Esq., Putney (gr. Mr. G. E. Day), for Odontoglossums, Odontiodas, &c.

To Messrs. Sander, for hybrids, Dendrobiums, &c.

To Messrs. Charlesworth, for a group which included the rare *Neomoorea irrorata*.

Silver Banksian Medal.

To G. Hamilton Smith, Esq., Finchley (gr. Mr. Coningsley), for *Lycaste Skinneri*, Cymbidiums, &c.

To Messrs. Hassall, Southgate, for a group with several good *Angraecum sesquipedale*.

To Messrs. Stuart Low, for a group.

To Messrs. McBean, for a group.

First-class Certificate.

To *Odontoglossum crispum* 'Samuel Gratrix' (votes, 15 for, 2 against), from Samuel Gratrix, Esq., Whalley Range, Manchester (gr. Mr. Brown). A superb variety said to have been home-raised. Flowers large and of fine shape, pure white, with light violet markings on the inner parts of the segments. (Fig. 57.)

Award of Merit.

To *Cattleya* × 'Dirce,' Westonbirt variety ('Miss Harris' var. 'Vulcan' × *Warscewiczii*) (votes, 11 for, 2 against), from Lieut.-Col. Sir George L. Holford, K.C.V.O., Westonbirt (gr. Mr. H. G. Alexander). A large-flowered hybrid, rosy-lilac veined with purple and bearing strong indications of *C. Schilleriana*, derived through *C.* × 'Miss Harris' (*Schilleriana* × *Mossiae*).

To *Odontoglossum* × 'Queen of Gatton' (*triumphans* × *percultum*) (votes, unanimous), from Sir Jeremiah Colman, Bart., Gatton Park (gr. Mr. Collier). Flowers, large and of good shape, pale yellow, blotched with red-brown; lip with some reddish blotches in front of the yellow crest.

Cultural Commendation.

To Mr. H. G. Alexander, gr. to Lieut.-Col. Sir George L. Holford, K.C.V.O., for a magnificent specimen of *Sophronitis grandiflora*, with nearly 100 flowers.

Other Exhibits.

Lieut.-Col. Sir George L. Holford, K.C.V.O.: hybrids.

Sir Jeremiah Colman, Bart., V.M.H.: rare species.

H. T. Pitt, Esq.: Cymbidiums.

Mr. E. V. Low: a group.

Messrs. Jas Veitch: new hybrid *Laeliocattleya*.

R. G. Thwaites, Esq.: Odontiodas.

E. H. Davidson, Esq.: *Odontoglossum crispum*.

J. H. Hill, Esq.: *Dendrobium* × *Austinii*.

J. T. Bennett-Poë, Esq.: *Cymbidium Colmanae*, Holmwood variety.

Monsieur Mertens: Odontoglossums.

G. M. Bird, Esq.: *Odontoglossum crispum Lucianii.*

Mr. C. F. Waters, Balcombe: *Cattleya Schröderae.*

de B. Crawshay, Esq.: a fine *Cymbidium insigne*, and hybrid *Odontoglossum.*

ORCHID COMMITTEE, APRIL 2, 1912.

Mr. J. GURNEY FOWLER in the Chair, and twenty-two members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Sander, St. Albans, for a group.

Silver Flora Medal.

To Messrs. Charlesworth, Haywards Heath, for rare Orchids.

To Messrs. Stuart Low, Bush Hill Park, for Cattleyas, Oncidiums, &c.

Silver Banksian Medal.

To Messrs. Hassall, Southgate, for Cattleyas and Odontoglossums.

To Messrs. McBean, for Odontoglossums and hybrids.

To R. G. Thwaites, Esq., Streatham (gr. Mr. J. M. Black), for Odontiodas.

First-class Certificate.

To *Cymbidium* × *Pauwelsii*, 'The Dell' variety (*Lowianum* × *insigne*) (votes, unanimous), from Baron Bruno Schröder, The Dell, Englefield Green). Flowers of good shape, cream-white, with faint purplish lines on the sepals and petals and purple marking on the front of the lip. The spike was 4 feet in length, and bore twenty flowers. (Fig. 58.)

To *Laeliocattleya* × *McBeaniana* (*L. anceps Schröderiana* × *C. Schröderae*) (votes, unanimous), from Messrs. McBean, Cooksbridge. Flowers large, white, with yellow disc, and purple front to the lip. (Fig. 59.)

To *Laeliocattleya* × *Trimyra* (*C. Trianiae* × *L.* × *Myra*) (votes, unanimous), from Sir Trevor Lawrence, Bart., K.C.V.O. (gr. Mr. W. H. White). Flowers large clear Indian yellow. (Fig. 62.)

Award of Merit.

To *Odontoglossum* × 'His Majesty' (parentage unrecorded) (votes, 15 for, 1 against). A fine hybrid with very large white flowers, with distinct chocolate-purple blotches.

To *Cypripedium* × 'Roger Sander' (*Godefroyae* × *glaucophyllum*) (votes, unanimous), from Messrs. Sander, St. Albans. Flower cream-white, beautifully lined and veined with claret colour, the lip spotted rose-purple.

To *Laeliocattleya* × 'Invincible' var. 'Orama' (*Dominiana* × *bletchleyensis*) (votes, 14 for, 2 against), from Messrs. Jas. Veitch.

FIG. 58.—CYMBIDIUM × PAUWELSII, THE DELL VAR. (p. lxxvi.)

[*To face p.* lxxvi.

Fig. 59.—Laeliocattleya × McBeaniana. (p. lxxvi.)

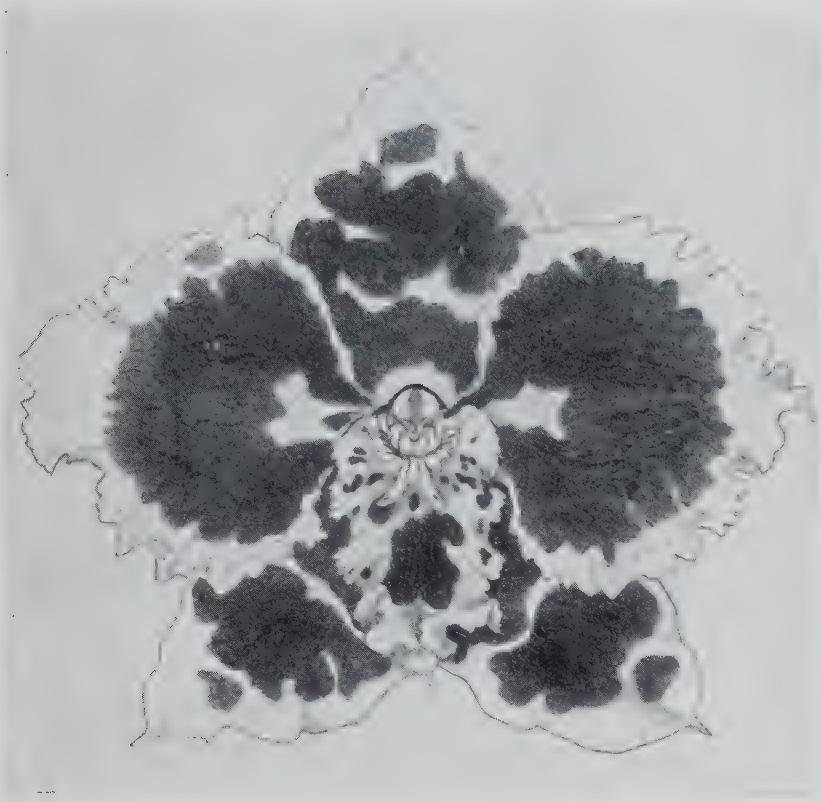


Fig. 60.—Odontoglossum crispum 'Saga.' (*Gardeners' Chronicle.*)
(p. lxxvii.)

Fig. 61.—Odontoglossum Uro-Skinneri, Burford Variety.
(*Gardeners' Chronicle.*) (p. lxxix.)

[*To face p.* lxxvii.

An improvement on the dark-coloured *L.* × *Dominiana*. Sepals and petals deep purplish-rose, lip dark claret colour.

To *Laeliocattleya* × 'Frederick Boyle,' Veitch's variety (*L. anceps Sanderiana* × *C. Trianiae*) (votes, 17 for, 1 against), from Messrs. Jas. Veitch. Sepals and petals white, tinged with pink. Lip with a yellow disc, and bright rose-purple front.

To *Odontioda* × *Cooksoniae*, Cobb's variety (*O. ardentissimum* × *C. Noezliana*) (votes, unanimous), from Walter Cobb, Esq., Normanhurst, Rusper (gr. Mr. C. J. Salter). A deep red flower, with white markings on the sepals and petals, and white front to the lip.

Other Exhibits.

Lieut.-Col. Sir George L. Holford, K.C.V.O.: *Cattleya* × 'Olaf.'

Sir Trevor Lawrence, Bart., K.C.V.O.: a group of Masdevallias.

Messrs. Armstrong & Brown: Cypripedium (*Prewettii* × *Germaine* 'Opoix').

de B. Crawshay, Esq.: *Odontoglossum* × *Lambeauanum*.

Arthur Legge, Esq., Worthing: Dendrobiums.

Mr. E. V. Low: Cattleyas.

F. M. Ogilvie, Esq.: hybrids.

Mrs. Norman Cookson: three Odontoglossums.

E. H. Davidson, Esq., Twyford: *Lycaste Skinneri alba*.

Francis Wellesley, Esq.: *Cattleya Trianiae* 'F. W. McBean.'

ORCHID COMMITTEE, APRIL 16, 1912.

Mr. J. GURNEY FOWLER in the Chair, and twenty-three members present.

Awards Recommended:—

Silver Flora Medal.

To Mrs. Norman Cookson, Oakwood, Wylam (gr. Mr. H. J. Chapman), for rare Odontoglossums.

To Messrs. Sander, St. Albans, for Cattleyas, Dendrobiums, &c.

To Messrs. Hassall, Southgate, for yellow Laeliocattleyas, &c.

To Messrs. J. Cypher for Dendrobiums, Cypripediums, &c.

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for hybrid Odontoglossums and Cattleyas.

To Messrs. Stuart Low, Bush Hill Park, for a group.

To the Liverpool Nursery Co. (John Cowan), for *Laeliocattleya* × 'G. S. Ball,' and other hybrids.

To Messrs. McBean, Cooksbridge, for Odontoglossums and Cattleyas.

First-class Certificate.

To *Odontoglossum crispum* 'Saga' (votes, 14 for, 2 against), from J. Gurney Fowler, Esq., Glebelands, South Woodford (gr. Mr. J.

Davis). A fine white flower, with the petals fringed and all the segments heavily blotched with reddish-purple. (Fig. 60.)

Award of Merit.

To *Cattleya Mendelii* 'Thule' (votes, 15 for, 5 against), from J. Gurney Fowler, Esq. Flowers large, pure white, with a faint blush tint on the lip.

To *Laeliocattleya* × 'Bertram' (*Hopkinsii* × *Cappei*) (votes, unanimous), from Francis Wellesley, Esq. Flowers over 6 inches across. Sepals and petals golden yellow, the petals having rose-purple veining. Lip almost entirely deep ruby-red, with claret veining.

Cultural Commendation.

To Mr. Stables, gr. to de B. Crawshay, Esq., for *Odontoglossum* × 'Souvenir de Victor Hye de Crom' (*Harryanum* × *luteo-purpureum*), with a spike 6 ft. 4 in. in length.

Other Exhibits.

Baron Bruno Schröder (gr. Mr. J. E. Shill): *Cattleya Schröderae* 'Empress,' with eleven flowers.

J. Gurney Fowler, Esq. (gr. Mr. J. Davis): two fine forms of *Cattleya Schröderae.*

J. T. Bennett-Poë, Esq. (gr. Mr. Downes): *Cymbidium Lowianum*, Holmwood variety.

Sir Jeremiah Colman, Bart., V.M.H. (gr. Mr. Collier): *Odontioda* × *gattonensis.*

A. Warren, Esq., Epsom (gr. Mr. Bridges): *Aerides virens*, white variety.

E. H. Davidson, Esq., Twyford: *Cattleya Schröderae alba*, Borlase's variety.

F. D. Godman, Esq., Horsham: hybrids and *Pleione yunnanensis.*

Monsieur F. Lambeau, Brussels: *Miltonia Hyeana* 'Vogelzang.'

Messrs. Peeters Brussels: *Miltonia vexillaria* 'Jurval.'

Monsieur F. Claes, Brussels: Cattleyas.

H. T. Pitt, Esq. (gr. Mr. Thurgood): a small group.

ORCHID COMMITTEE, APRIL 30, 1912.

Mr. J. GURNEY FOWLER in the Chair, and twenty-four members present.

Awards Recommended:—

Silver Flora Medal.

To Mr. Sidney Flory, Tracy's Nursery, Twickenham, for Cattleyas, Odontoglossums, and interesting species.

Silver Banksian Medal.

To Messrs. Stuart Low, Bush Hill Park, for Dendrobiums and other showy Orchids.

Fig. 62.—Laeliocattleya × Trimyra. (

To Messrs. Sander, St. Albans, for a group.

To Messrs. Charlesworth, Haywards Heath, for hybrids and rare species.

To Messrs. McBean, Cooksbridge, for Cattleyas, Odontoglossums, &c.

Bronze Banksian Medal.

To Messrs. J. Cypher, Cheltenham, for a group.

To Messrs. Hassall, Southgate, for a group.

First-class Certificate.

To *Odontoglossum Uro-Skinneri*, Burford variety (votes, unanimous), from Sir Trevor Lawrence, Bart., K.C.V.O., Burford (gr. Mr. W. H. White). The largest and best-coloured form of the species. Sepals and petals greenish-yellow, spotted with chestnut brown; lip 2 inches across, white, spotted with rose colour. (Fig. 61.)

To *Cattleya Schröderae* 'Glebelands' (votes, unanimous), from J. Gurney Fowler, Esq., South Woodford (gr. Mr. J. Davis). A fine blush-white flower, with the lip for the greater part deep chrome yellow; margin tinged with lilac.

Other Exhibits.

J. Gurney Fowler, Esq.: *Odontioda* × 'Royal Gem.'

Sir Trevor Lawrence, Bart., K.C.V.O.: *Brassolaeliocattleya* × *Triune.*

W. R. Lee, Esq.: *Odontioda* × *Leeana.*

F. M. Ogilvie, Esq.: two hybrids.

F. P. Walker, Esq.: *Odontoglossum* hybrid.

Mrs. S. Gratrix: *Odontoglossum crispum* 'Mary Gratrix.'

Francis Wellesley, Esq.: Cattleyas.

Sir Jeremiah Colman, Bart.: *Dendrobium acuminatum.*

ESTABLISHED 1804. INCORPORATED 1809.

TELEGRAMS "HORTENSIA, LONDON." TELEPHONE: 5363 VICTORIA.

ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W.

NOTICES TO FELLOWS.

1. GENERAL.

Notices to Fellows are always added at the end of each number of the JOURNAL, immediately preceding the Advertisements, and also at the beginning both of the "Book of Arrangements" and of the "Report of the Council." Fellows are particularly requested to consult these Notices, as it would often save them and the Secretary much needless correspondence.

2. LETTERS.

All letters on *all* subjects should be addressed—The Secretary, Royal Horticultural Hall, Vincent Square, Westminster, S.W.

7. PRIVILEGES OF CHEMICAL ANALYSIS.

Instructions are contained at page 84 in the "Book of Arrangements," 1912.

8. LIST OF FELLOWS.

A list of all the Fellows of the Society is sent out in January. Fellows are requested to look at their own names in it, and if in any way these are incorrect, or the address insufficient, they are requested to inform the Secretary at once. Forms of Nomination, and of the Privileges of Fellows, are bound in with every number of the JOURNAL (Advt. pp. 32, 33) and the "Book of Arrangements."

9. NEW FELLOWS.

The President and Council fully appreciate how much the prosperity of the Society and its present large number of Fellows are due to the efforts of Fellows to enlist the sympathy of their friends; and the steady advance during recent years indicates the increasing recognition of the Society's work and usefulness. But it must not be supposed that a maximum has yet been reached. There is ample room for a great increase of Fellows, especially in America and the Colonies.

10. AN APPEAL.

What has been accomplished for the Society since 1887 is largely due to the unwearied assistance afforded by a small proportion of the Fellows; but as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially by:—

1. Increasing the number of Fellows.
2. Helping to swell the General Prize Fund started by Mr. A. W. Sutton, V.M.H., for providing Prizes for the Students at Wisley.
3. Providing lectures with lantern slides.
4. Presenting books to fill the gaps in the Library both at Vincent Square and at Wisley.
5. Sending new and rare Plants and Seeds for the Garden and surplus Roots for distribution to the Fellows.
6. Sending Plants for the *New Rock Garden* at Wisley.

Thus there is plenty for all to do according to their individual liking: personal effort, money, plants, books, are all alike needed. The Secretary asks those who read these lines to help in the ways above indicated.

Mr. C. Herman Senn, the Honorary Secretary of the Cookery and Food Association, has offered a Prize of £1 1*s.* to the Students at Wisley for the best essay on "How best to keep up through the year a continuous supply of Vegetables suitable to a private garden."

11. R.H.S. GARDENERS' DIARY.

The Shropshire Horticultural Society's Show appears in the Gardeners' Diary under the dates August 22 and 23. The correct dates are August 21 and 22. Will Fellows please alter their Diaries accordingly?

3. TELEPHONE AND TELEGRAMS.

Telephone Number: **5363 VICTORIA.**

"**HORTENSIA, LONDON,**" is sufficient address for telegrams.

4. JOURNALS WANTED.

The Secretary would be greatly obliged by the return to the Society of ANY NUMBERS of the JOURNAL which may be of no further use to Fellows. Complete sets are occasionally applied for, but, at the present moment, not even one can be supplied owing to the stock of the following being exhausted:—

VOLUME IV. Part 14.	VOLUME XIII. Part 1.
VOLUME V. Part 1.	VOLUME XIV.
VOLUME X.	VOLUME XV. Parts 2 and 3.

These are therefore particularly asked for.

5. SUBSCRIPTIONS.

All Subscriptions fall due on January 1st of each year. To avoid the inconvenience of remembering this, Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1st. It may be a week or more before the Tickets reach the Fellows, owing to the very large number (over 20,000) to be despatched within the first month of the year. Fellows who have not already given an order on their bankers for the payment of their subscriptions each year are requested to do so, as this method of payment is preferred, and saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society" and crossed "London County and Westminster Bank, Victoria Branch, S.W."

6. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £ , to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of my decease; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

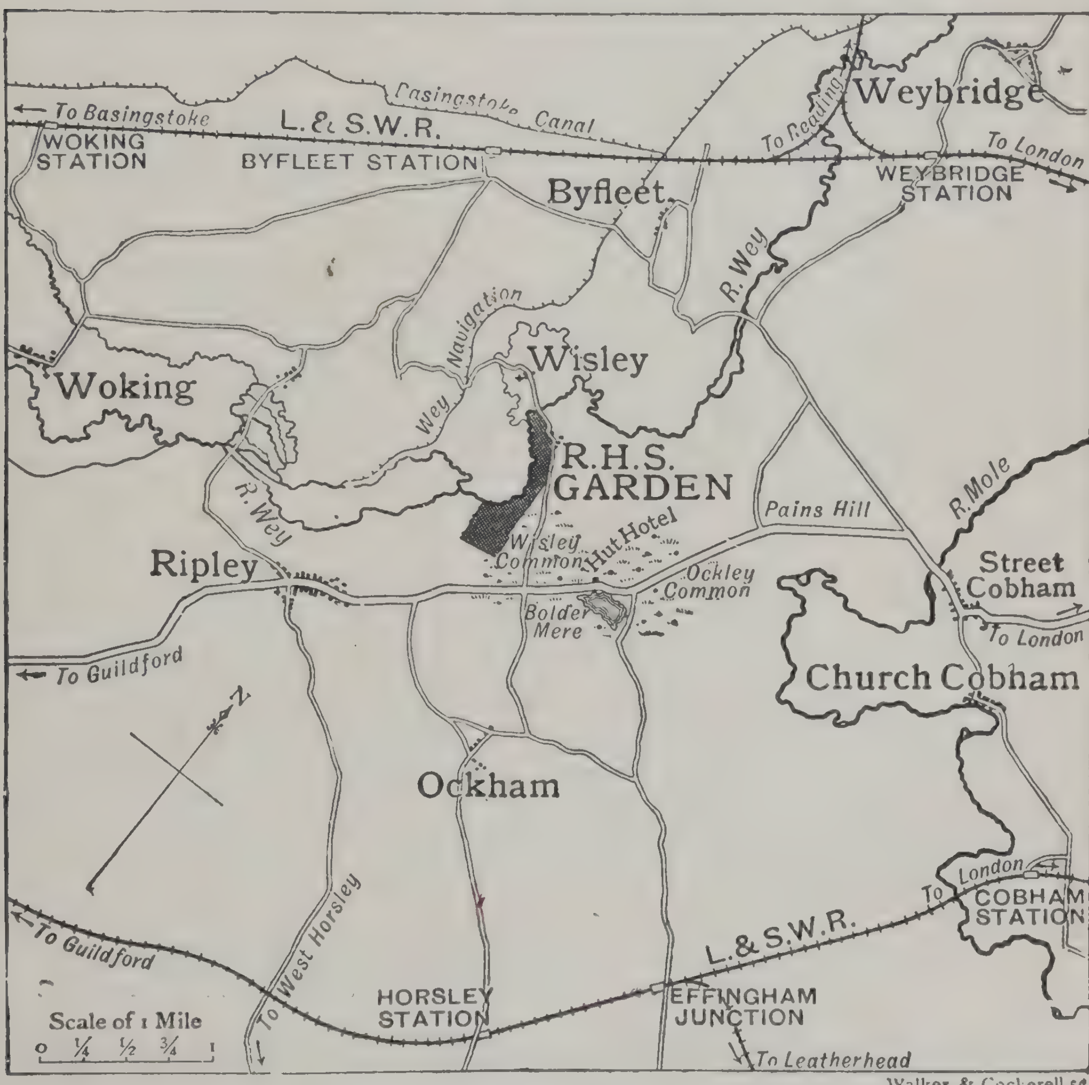
* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

12. LINDLEY LIBRARY.

The Society acting in and through its Council, having now become sole trustee of the Lindley Library, Fellows and friends of the R.H.S. have the encouragement of knowing that their gifts to the Library can never be lost to the Society, but are attached to it in perpetuity. It should now be the aim of all to make the Library far more perfect and complete than it is at present. Gifts of books, old or new, will be gratefully accepted.

13. THE SOCIETY'S GARDENS AT WISLEY.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till sunset, except on Sundays, Good



POSITION OF THE SOCIETY'S GARDENS.

Friday, Christmas Day, and Exhibition Days. Each Fellow's Ticket admits three to the Gardens. The Public are not admitted.

The Gardens, situated at Wisley (about 2 miles from Ripley, in Surrey), are about 3 miles from Byfleet, 3½ miles from Horsley, and 5½ miles from Weybridge, all stations on the South-Western Railway, with frequent trains from Waterloo and Clapham Junction. Carriages

to convey four persons can be obtained by writing to Mr. D. White, fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge, waiting two hours at the Gardens, 8*s.*; or waiting three hours, 10*s.*; or to and from Horsley, 7*s.*; Effingham Junction, 7*s.*; Byfleet, 7*s.* Visitors should in all cases be careful to state the trains they intend to arrive by and leave by. Carriages can also be obtained at Weybridge for 8*s.* by writing to Mr. Trembling, New Road, Weybridge. Excellent accommodation and refreshments can be had at the Hut Hotel, close to the Gardens, and also at the Hautboy at Ockham.

The motor route from London to Wisley will be found in the "Book of Arrangements," p. 123.

14. ROCK GARDEN AT WISLEY.

In consequence of the rapidly increasing interest taken in what are popularly called "Alpine Plants," "Alpines," or "Rock Plants," the Council have constructed a Rock Garden at Wisley on a somewhat extensive scale. The idea is to obtain the best possible positions and soils for the different plants to grow in, the growth and well-being of the plants being considered to be of even greater importance than the artistic effect of the rockwork. In a Horticultural Society's Garden every single detail should teach something, so that Fellows visiting it may be able to take away an idea of how best to do this or that or where best to plant this or that. The construction of the Rock Garden is completed, and the planting is proceeding, but it will be two, or possibly three, years or more before the plants on it can be seen at their best.

15. NEW BOTHY AT WISLEY.

The Council have always been anxious to promote the welfare of their gardeners, and with this object in view they have recently completed a new bothy, which they hope may prove of use far and wide as establishing the desirable *via media* between extravagance on the one hand and disregard of the men's comfort on the other. It may well serve as a model for the construction of bothies elsewhere.

16. TRIALS AT WISLEY IN 1912-13.

The Special Regulations for the direction of Trial Sub-Committees will be found on p. 31, Book of Arrangements.

N.B.—Everything sent for trial *must be named*, and the name and address of the sender attached.

Fruit.

Strawberries, Autumn Fruiting.—20 runners of each.

Melons.—Not less than six seeds of each in February.

Fruit berries.—Three plants of each by February. Strawberries, Raspberries, Gooseberries, Currants excluded.

Flowers.

Cape Pelargoniums.—Two cuttings of each (rooted or otherwise) as soon as possible. See next page.

Violas.—Six plants of each to be sent in February.

Bedding Pelargoniums (Geraniums).—Three plants of each in May.

Montbretias.—Six corms of each in February.

Kniphofias (Tritomas).—Three plants of each in February.

Lobelias of the cardinalis, fulgens, and syphilitica sections.—Three plants of each in February.

Vegetables.

Vegetable Marrows.—Not less than six seeds of each variety in February.

Potatos.—Early and mid-season. Each variety must be labelled as being "early" or "mid-season." Twenty tubers of each by February.

Trial of Cape Pelargoniums.

The Council of the Royal Horticultural Society have been asked to endeavour to obtain an agreement on the Nomenclature of what are commonly known as Cape Pelargoniums. The only practical way known to the Council is to invite all growers of these plants to *at once* send cuttings (rooted or otherwise) with the name known to the sender attached, by post to the Superintendent, R.H.S. Gardens, Wisley, Ripley, Surrey. They will be potted up and next year be compared with each other, and with herbarium specimens, and printed records. No Zonals or Show or French Pelargoniums should be sent; only those known as 'Cape.'

If sent by post: The Superintendent, R.H.S. Gardens, Wisley, Ripley, Surrey.

If sent by rail: The Superintendent, R.H.S. Gardens, Wisley, Horsley Station, L. &. S.-W. R., with advice by post to the Superintendent.

17. THE WISLEY RESEARCH STATION.

Investigations are now in full swing at the new Research Station and Laboratory at Wisley. All communications relating to them should be addressed to Mr. F. J. Chittenden, F.L.S., Director of the Research Work on Scientific Matters affecting Practical Horticulture, and Lecturer to the Students.

18. STUDENTS AT WISLEY.

N.B.—There will be a few vacancies for the two years' Course commencing in March, 1913. Early application should be made to the Secretary.

The Society admits young men, between the ages of 16 and 22 years, to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Horticulture, but also lectures, demonstrations, and Elementary Horticultural Science in the Laboratory, whereby a practical knowledge of simple Garden Chemistry,

Biology, &c., may be obtained. The Laboratory is equipped with the best apparatus procurable for Students. The training extends over a period of two years, with a progressive course for each year. Students can only enter at the end of September or at the end of March. Selected Students have also the advantage of attending certain of the Society's Shows and Lectures in London.

19. DISTRIBUTION OF SURPLUS PLANTS.

In a past Report the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive such surplus plants? It was therefore decided to keep all plants till the early spring, and then give all Fellows alike the option of claiming a share of them by Ballot.

Fellows are therefore particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are, of necessity, *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the "Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is therefore obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to fill up their application form before April 30 must be content to wait till the next year's distribution. The work of the Gardens cannot be disorganized by the sending out of plants at any later time in the year. All Fellows can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. The charge for this will be collected by the carriers on delivery of the plants, which will be addressed exactly as given by each Fellow on his

application form. It is impracticable to send plants by post, owing to the lack of Post Office facilities for despatch without prepayment of postage.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled.

Plants cannot be sent to Fellows residing outside the United Kingdom, owing either to length of time in transit or to vexatious regulations in some foreign countries; but the Council will at any time endeavour to obtain for Fellows living abroad any unusual or rare seeds which they may have been unable to procure in their own country.

No plants will be sent to Fellows whose subscription is in arrear, or who do not fill up their forms properly.

20. EXHIBITIONS, MEETINGS, AND LECTURES IN 1912.

The programme will be found in the "Book of Arrangements" for 1912. An Exhibition and Meeting is held practically every fortnight throughout the year, and a short lecture on some subject connected with Horticulture is delivered during the afternoon.

A reminder of every Show will be sent in the week preceding to any Fellow who will send to the R.H.S. Offices, Vincent Square, S.W., a sufficient number (34) of halfpenny cards *ready addressed* to himself.

21. DATES FIXED FOR 1912.

Jan. 9, 23
Feb. 6, 13 (Annual Meeting only), 20
March 5 and 6 (Bulb Show), 19, 21–22 (Carnations)
April 2, 16 and 17 (Daffodils), 30
May 14
June 4, 18, 19 (Hardy Plants)
July 2–4 (Summer Show), 9 & 10 (Sweet Peas), 16, 23 (Carnations), 30
Aug. 13, 27
Sept. 10, 12 (Autumn Rose Show), 24 (Vegetables)
Oct. 8, 10–11 (Fruit Show), 22
Nov. 5 and 6 (Orchids), 19
Dec. 3, 4 (Carnations)

22. CHALLENGE CUPS.

Affiliated Societies' Cup.

A Ten guinea Silver Cup is to be annually offered at the Society's Summer Show, to be competed for by Affiliated Societies. The Society winning the Cup is to hold it in perpetuity as the property of the R.H.S., but is to re-offer it annually at its own Shows for competition as a Challenge Cup. A Society may not win one of these Cups more than once in ten years, and it shall revert to the R.H.S. on the Affiliated Society ceasing to exist or ceasing to be affiliated. For further particulars see "Book of Schedules" for 1912.

For Vegetables.

A handsome Silver-gilt Challenge Cup has been presented to the Society by Messrs. Sutton, of Reading, and the Council will again offer

it, with £10, for vegetables on September 24, 1912. The Society also offers a Champion Challenge Cup for the greatest number of points obtained by any one exhibitor throughout the same Exhibition, the winner of the Sutton Cup being excluded. These Cups may be won by the same exhibitor only once in three years, but he may compete every year for any second prize that may be offered.

23. CONFERENCES.

(a) *Orchids.*

A Conference on Orchids will be held in the Lecture Room at Vincent Square, S.W., on the second day of the Orchid Show, November 6, the times fixed being 11 A.M. to 1 P.M., and 2 P.M. to 4 P.M. The programme of the Conference will appear in due course.

(b) *Primulas.*

It has been decided to hold a Conference on Primulas in April 1913, in the Lecture Room at Vincent Square, when Sir John Llewellyn, Bart., will occupy the Chair. Fuller particulars will be made known later.

24. DATES OF SPECIAL R.H.S. SHOWS IN 1913.

Spring Bulb Show, March 4 and 5
Daffodil Show, April 15 and 16
Spring Show, May 20 to 22
Summer Show, July 1, 2, and 3
Vegetable Show, September 23
Autumn Fruit Show, October 9 and 10

25. EXAMINATIONS, 1913.

1. The Annual Examination in the Principles and Practice of Horticulture will be held on April 2, 1913. The Examination has two divisions, viz. (*a*) for Candidates of eighteen years of age and over, and (*b*) for Juniors *under* eighteen years. Particulars for 1913 may be obtained by sending a stamped and directed envelope to the Society's Offices. Copies of the Questions set from 1893 to 1910 (price 2*s*. post free) may also be obtained from the Office. The Society is willing to hold an Examination wherever a magistrate, clergyman, schoolmaster, or other responsible person accustomed to examinations will consent to supervise one on the Society's behalf.

The Examination will not be held outside the British Isles until further notice.

In connexion with this Examination a Scholarship of £25 a year for two years is offered by the Worshipful Company of Gardeners, to be awarded after the 1913 Examination to the student who shall pass highest, if he is willing to accept the conditions attaching thereto. The main outline of these conditions is that the holder must be of the male sex, and between the ages of 18 and 22 years, and that he should study gardening for one year at least at the Society's Gardens at Wisley, conforming to the general rules laid down there for Students. In the

second year of the Scholarship he may, if he like, continue his studies at some other place at home or abroad which is approved by the Council of the Society. In case of two or more eligible Students being adjudged equal, the Council reserve to themselves the right to decide which of them shall be presented to the Scholarship.

2. The Society will also hold an Examination in Cottage Gardening on April 23, 1913. This Examination is intended for, and is confined to, Elementary and Technical School Teachers. It is undertaken in view of the increasing demand in country districts that the Schoolmaster shall be competent to teach the elements of Cottage Gardening, and the absence of any test of such competence. The general conduct of this Examination is on similar lines to that of the more general Examination. Questions on Elementary Chemistry and Biology are included in this Examination.

Medals and Certificates are awarded and Class Lists published in connexion with these Examinations. The Syllabus may be obtained on application to the Secretary, R.H.S., Vincent Square.

26. INFORMATION.

Fellows may obtain information and advice from the Society as to the names of flowers and fruit, on points of practice, insect and fungoid attacks, and other questions, by applying to the Secretary, R.H.S., Vincent Square, Westminster, S.W. Where at all practicable it is particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the Fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

27. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost, viz. a fee of £3 3*s.* for one day (or £5 5*s.* for two consecutive days), together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their gardens. Gardens can only be inspected at the *written* request of the *owner.*

Nota Bene.—The work of inspecting Fellows' gardens and advising thereupon has increased so much of recent years, and has necessitated Mr. Wright's absence from the Wisley Garden so often, that the Council of the Society have long felt the desirability of appointing an Inspector of Fellows' gardens who should be entirely independent of the Wisley staff, thus leaving Mr. Wright free to devote his whole time to the Society's Garden and to the Society's Shows.

The very great difficulty of finding an Inspector who should not only be as efficient and capable as Mr. Wright, and one who is also in constant touch with a fine garden and all the newest additions to horticulture, has at last been overcome by the kindness of Miss Willmott, of Warley, who

has consented to her head gardener, Mr. C. R. Fielder, V.M.H., being appointed Inspector to the Society and at the same time allowing him to remain in constant daily touch with her celebrated garden at Warley Place.

From May 1, therefore, Mr. C. R. Fielder, V.M.H., so well and honourably known in gardening circles, will be the Royal Horticultural Society's Inspector to visit Fellows' gardens, and to advise thereupon on the terms mentioned on page 8 of the "Book of Arrangements," 1912. All requests for the Inspector's services should be made to the Secretary, R.H.S. Office, Vincent Square, Westminster, S.W.

28. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many new branches of work undertaken since the reconstruction of the Society in 1887 is the unification of local Horticultural Societies by a scheme of affiliation to the R.H.S. Since this was initiated no fewer than 300 Societies have joined our ranks, and the number is steadily increasing.

To the privileges of Affiliated Societies have been added all the benefits accruing under the scheme recently introduced for the Union of Horticultural Mutual Improvement Societies.

Secretaries of Affiliated Societies can obtain on application a specimen of a Card which the Council have prepared for the use of Affiliated Societies for Certificates, Commendations, &c. Price 3*s.* 6*d.* for 10 copies, 5*s.* 6*d.* for 20, 11*s.* 6*d.* for 50, 20*s.* for 100.

The Council have also struck a special Medal for the use of Affiliated Societies. It is issued at cost price in Bronze, Silver, and Silver-gilt—viz. Bronze, 5*s.* 6*d.*, with case complete; Silver, 12*s.* 6*d.*, with case complete; Silver-gilt, 16*s.* 6*d.*, with case complete. Award Cards having the Medal embossed in relief can be sent with the Medal if ordered, price 6*d.* each.

29. CARDS FOR EXHIBITS OF VEGETABLES, &c., INDICATING THE POINTS CONSTITUTING GOOD QUALITY.

Affiliated Societies' Exhibitions.

As an outcome of a suggestion made to the Secretary by an Affiliated Society, the descriptions of "excellence" of various fruits and vegetables, appearing in the R.H.S. Code of Rules for Judging, have been printed on stiff cards, thus:

ROYAL HORTICULTURAL SOCIETY.

RULES FOR JUDGING: Section 100.

CARROTS.—Of medium size according to variety;
Good and even form;
Skin and colour clear and bright;
Free from side roots;
Flesh tender.

Points 8.—Form and Colour	. . . .	3
Condition	. . . .	2
Uniformity	. . . .	2
Size	. . . .	1

The intention is that these cards should be put up conspicuously at Affiliated Societies' Shows amongst the exhibits of vegetables, &c., referred to. Their educational value will be at once apparent, for visitors, instead of viewing the exhibits with little or no idea of what constitutes excellence, will have before them, near each exhibit, the "points" from a Judge's standpoint. Thus they will see for themselves where an exhibit has succeeded or failed, and in what direction their own efforts should be turned if they are to become prize-winners.

There are 25 cards in the set, and the subjects dealt with are Carrot, Kale, Leek, Beans, Cucumber, Cauliflower, Beet, Radish, Celery, Pea, Spinach, Tomato, Rhubarb, Cabbage, Brussels Sprouts, Potato, Parsnip, Vegetable Marrow, Lettuce, Turnip, Onion, &c. The price is 7*s.* 6*d.* a set, from the Secretary, R.H.S., Vincent Square, S.W.

30. UNION OF HORTICULTURAL MUTUAL IMPROVEMENT SOCIETIES.

This Union has been established for the encouragement and assistance of Horticultural Mutual Improvement Societies, the object being to strengthen existing Societies, to promote interchange of lecturers, to provide printed lectures, and if possible to increase the number of these useful Societies.

A new and revised list of lecturers and their subjects, and a list of typewritten lectures, with or without lantern slides, prepared by the Society, may be obtained from the Secretary, R.H.S., price 3*d.*

Lantern slides on horticultural topics are much needed, and their gift will be very much appreciated.

31. RULES FOR JUDGING—1911 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," have been revised, and the new edition is now ready. Special attention is drawn to the amended Rule defining "an amateur," with suggestions for establishing four distinct classes of amateurs to meet the requirements of larger or smaller local Societies. (See also p. 168, "Book of Arrangements.") The "pointing" recommended for fruits and vegetables has also been considerably amended, and the terms "annuals" and "biennials" further explained. The secretaries of local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1*s.* 6*d.*, addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W.

Exhibitors of vegetables are specially warned that the numbers of specimens to a dish appearing on p. 19 of the 1909 Code of Rules have been still further modified.

32. SPRAYING OF FRUIT TREES.

The Report of the Conference on the Spraying of Fruit Trees, held in the R.H.S. Hall on October 16, 1908, may still be obtained at the Society's Offices, Vincent Square, Westminster, price 1*s*. The book deals with the methods of spraying fruit trees for both insect and fungus pests, with information as to washes and spraying machinery, and forms the latest collated information on this subject.

33. VARIETIES OF FRUITS.

Many people plant fruit trees without a thought of what variety they shall plant, and as a result almost certain disappointment ensues, whilst for an expenditure of 2*d*. they can obtain from the Society a little 16-page pamphlet which contains the latest expert opinion on Apples, Pears, Plums, Cherries, Raspberries, Currants, Gooseberries, and Strawberries, together with Notes on Planting, Pruning, and Manuring, which for clearness of expression and direction it would be impossible to surpass. It has in fact been suggested that no other 16 pages in the English language contain so much and such definite information. At the end of the pamphlet are given the names of some of the newer varieties of fruits, which promise well, but are not yet sufficiently proved to be recommended for general planting.

Copies of this pamphlet for distribution may be obtained at the Society's Office, Vincent Square, Westminster. Price, post free: single copy, 2*d*., or 25, 2*s*.; 50, 3*s*.; 100, 4*s*.

34. PLANTS CERTIFICATED.

The last-published list of "Plants Certificated by the Society" commenced with the year 1859 and closed with 1899. A further 11 years have now passed and the Council have republished the list up to the end of 1910, constituting a record of all the plants which have received awards during the past 50 years. The completed list will be of great assistance to amateurs and an absolute necessity to raisers and introducers of new plants. It is now ready, price 2*s*. post free, not including Orchids.

Orchids Certificated.

The list of awards made to Orchids, with parentage, &c., has recently been published separately, and may be obtained at the Society's Office, Vincent Square, Westminster, bound in cloth and interleaved, price 5*s*. net.

35. RECOGNITION OF DILIGENT INTEREST IN PLANTS.

The Council have founded a card of "Recognition of Diligent Interest in Plants." Issued in response to frequent applications by school authorities for some token of encouragement of work with plants amongst scholars, it is to be awarded to the boy or girl (or both) who, in the yearly school competitions in plant cultivation, or garden plot keeping,

or Nature study, has secured the first prize. The cards are 12 inches by 8 inches, and may be had on application to the Secretary, R.H.S., Vincent Square, London, S.W. (price 6*d.* each). The application should contain information as to (*a*) the nature of the competition, (*b*) the number of competitors, (*c*) the judges, (*d*) the number of prizes awarded in the competition, (*e*) the full name of the first prize winner, and should be signed by the head teacher and a member of the education authority concerned. The Council of the R.H.S. will at their own absolute discretion grant or withhold this "recognition."

36. MS. FOR JOURNAL.

The Editor is always glad to receive suitable articles for issue in the Journal from corresponding and other Fellows of the Society. It is thought that much more might be done in this direction to disseminate valuable botanical and horticultural information, and to publish records of work and research conducted by other than actual official members of the Society. The Journal is received by the best libraries in the world, and is regularly sent to all the 12,000 Fellows of the Society.

37. ADVERTISEMENTS.

Fellows are reminded that the more they can place their orders with those who advertise in the Society's Publications the more likely others are to advertise also, and in this way the Society may be indirectly benefited.

FELLOWS' PRIVILEGES OF CHEMICAL ANALYSIS.

(Applicable only to the case of those Fellows who are not engaged in any Horticultural Trade, or in the manufacture or sale of any substance sent for Analysis.)

THE Council have fixed the following rates of charges for Chemical Analysis to Fellows of the Society being *bonâ fide* Gardeners or Amateurs.

These privileges are applicable only when the Analyses are for *bonâ fide* horticultural purposes, and are required by Fellows for their own use and guidance in respect of gardens or orchards in their own occupation.

The analyses are given on the understanding that they are required for the individual and sole benefit of the Fellow applying for them, and must not be used for the information of other persons, or for commercial purposes.

Gardeners, when forwarding samples, are required to state the name of the Fellow on whose behalf they apply.

The analyses and reports may not be communicated to either vendor or manufacturer, except in cases of dispute.

When applying for an analysis, Fellows must be very particular to quote the number in the following schedule under which they wish it to be made.

No.		
1.	An opinion on the purity of bone-dust (each sample)	2*s.* 6*d.*
2.	An analysis of sulphate or muriate of ammonia, or of nitrate of soda, together with an opinion as to whether it be worth the price charged	5*s.*
3.	An analysis of guano, showing the proportion of moisture, organic matter, sand, phosphate of lime, alkaline salts and ammonia, together with an opinion as to whether it be worth the price charged	10*s.*
4.	An analysis of mineral superphosphate of lime for soluble phosphates only, together with an opinion as to whether it be worth the price charged	5*s.*
5.	An analysis of superphosphate of lime, dissolved bones, &c., showing the proportions of moisture, organic matter, sand, soluble and insoluble phosphates, sulphate of lime and ammonia, together with an opinion as to whether it be worth the price charged	10*s.*
6.	An analysis of bone-dust, basic slag, or any other ordinary artificial manure, together with an opinion as to whether it be worth the price charged	10*s.*
7.	Determination of potash in potash salts, compound manures, &c.	7*s.* 6*d.*
8.	An analysis of compound artificial manures, animal products, refuse substances used for manure, &c.	from 10*s.* to £1
9.	An analysis of limestone, showing the proportion of lime	7*s.* 6*d.*
10.	Partial analysis of a soil, including determinations of clay, sand, organic matter, and carbonate of lime	10*s.*
11.	Complete analysis of a soil	£3
12.	Analysis of any vegetable product	10*s.*
13.	Determination of the "hardness" of a sample of water before and after boiling	5*s.*
14.	Analysis of water of land-drainage, and of water used for irrigation	£1
15.	Analysis of water used for domestic purposes	£1 10*s.*
16.	Consultation by letter	5*s.*

Letters and samples (postage and carriage prepaid) should be addressed to the Consulting Chemist, Dr. J. AUGUSTUS VOELCKER, 22 Tudor Street, New Bridge Street, London, E.C.

The fees for analysis must be sent to the Consulting Chemist at the time of application.

Instructions for selecting, drawing, and sending samples for analysis will be found in the Society's "Book of Arrangements," or can be obtained on application to the Society's Office, Vincent Square, S.W.

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

GENERAL MEETING.

May 14, 1912.

Sir Daniel Morris, K.C.M.G., V.M.H., in the Chair.

Fellows elected (137).—O. H. Abbott, Miss F. Abraham, Miss D. G. Adams, W. F. Adams, Mrs. P. S. Anderson, G. B. Ash, Mrs. G. Balfour, H. Barker, W. E. Barnett, Sir J. Wolfe Barry, Mrs. Beck, S. G. Beer, Major C. H. Bennett, W. H. Beresford, Mrs. K. Bittleston, Miss D. Brailsford, W. Buckler, H. Bull, Mrs. H. Bull, Mrs. A. H. Carrington, S. Castle, W. M. Cazalet, E. Clement, J. Coey, E. H. Coleman, Mrs. A. Colyer, E. K. Corbet, Miss M. F. Cramphorn, J. Crichton-Stuart, Lady Crossley, E. Daniels, H. Davies, R. E. d'Ascoli, Hon. Mrs. A. de Grey, Mrs. de Salis, Mrs. J. Dickson, F. A. Dinham, Mrs. du Cros, Dowager Countess of Dudley, Mrs. E. Farquhar, W. F. Farrer, Miss L. M. Firth, C. P. Foster, Miss K. Freshfield, Rt. Hon. Sir Edward Fry, G.C.B., R. Garnett, Mrs. L. M. Garrett, Lieut.-Col. J. B. Gaskell, E. H. Girling, Mrs. W. B. Girling, Mrs. L. Glass, Miss A. M. Goldfinch, Mrs. L. Goldsmith, Mrs. Barnett-Gow, Mrs. J. Hunter Gray, Mrs. E. Gubbins, J. H. Gurney-Smith, Miss Hammerton, Mrs. H. M. Harford, H. Harrild, F. Harrison, E. Hartjen, E. B. Hayman, G. Hayward, Dr. W. C. Hearnden, Mrs. R. S. Henderson, G. Hignett, J. C. Hodgson, Lady Holroyd, F. Hudson, Miss Huntingdon, Mrs. C. Jay, Mrs. F. Jay, Mrs. Jewell, Miss Johnston, Miss H. Mansel-Jones, Mrs. A. King, H. F. Kingham, Miss S. M. Kingsford, Captain C. E. Kitchin, Mrs. L. F. Lane-Fox, S. Chetwynd Leech, Mrs. Chetwynd Leech, Mrs. R. C. Lehmann, Mrs. Lowenadler, Miss E. Lucas, Mrs. A. Lupton, Mrs. D. A. MacAlister, Dr. J. E. R. MacDonagh, Mrs. J. S. F. Mackenzie, Mrs. E. Mackintosh, Mrs. J. Macmillan, Miss G. Major, Miss E. May, W. M. Mellor, J.P., W. M. F. Mellor, Dr. W. J. Milles, E. S. Mond, A. H. A. Morton, Miss Muir, Mrs. F. T. Murdoch, G. R. Murray, Dr. Flora Murray, Major A. H. Ollivant, Mrs. Newcome, Miss E. E. Newton, E. J. Norris, T. Nottidge, Col. H. H. Peel, Mrs. E. R. Phillpotts, Mrs. Pike, Lady Porter, Mrs. Powell, Mrs. H. Ranking, A. R. Rathbone, Miss Rickatson, Mrs. W. A.

Sargeant, G. C. Sawday, J. Sheldon, Mrs. Shiers, Mrs. Silver, Sir John Sinclair, Bart., D.S.O., T. E. Tomalin, Mrs. Tomlin, Miss H. M. Tremayne, C. J. Trevarthen, Major W. D. C. Trimnell, Miss M. A. Usborne, Mrs. Vandervell, Mrs. van Sandan, Mrs. Vincent, Mrs. S. Wade, Mrs. Walker, Mrs. Webb, F. G. Wheeler, R. E. Williams, Lady Muriel Worthington.

Fellows resident abroad (2).—G. H. Perkins (Canada), F. H. Snow (S. Australia).

Associates (2).—Miss G. Kalisky, C. Shoyler.

Societies affiliated (2).—Folkestone Gardeners' Society, Parkstone Gardeners' Association.

The Seventh Masters Memorial Lecture on "Gardening and Drought" was given by Professor I. Bayley Balfour, F.R.S., V.M.H. (see p. 206).

THE R.H.S. BANQUET TO FOREIGN HORTICULTURISTS ON FRIDAY, MAY 24, 1912, IN CONNEXION WITH THE ROYAL INTERNATIONAL HORTICULTURAL EXHIBITION.

A very large number of the Fellows of the Society will have visited the magnificent International Horticultural Exhibition which was held at Chelsea on May 22 to 30, 1912. From the moment of its inception the President and Council of the Society have shown their willingness to assist the directors to the utmost of their power in promoting so important an Exhibition, and they also felt they could not allow so grand an opportunity to pass without in some way tendering a social welcome from the old Society to the multitude of foreign horticulturists gathered together in London for the Exhibition. It was therefore decided to invite as many of them as possible to a grand banquet in the Hall of the Society at Vincent Square. About 450 guests accepted the Society's invitation. They were received by the President, Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H., in the Lecture Room, and while waiting for dinner to be announced they were given the opportunity of seeing the Council Room and Library and the valuable portraits hanging therein.

The large Hall was very tastefully arranged for the banquet. Groups of large palms and other plants had been placed in suitable positions, and these, with the floral decorations of the forty-one round tables laid for the guests, gave a bright and pleasing effect. From the moment of the reception by the President to the moment of departure there was a tone of warm friendliness, sociability, and informality pervading the evening.

The dinner was provided by Messrs. Searcy Tansley, of Connaught Street, W., and was excellently and quickly served under the personal superintendence of Mr. Hellyer, the manager.

During dinner, by his kind permission, the private band of Alfred de Rothschild, Esq., conducted by Herr Carl Heubert, discoursed a charming selection of music. And after dinner Monsieur Tivadar

Nachez delighted all his hearers with several beautiful selections on the violin, of which he is so perfect a master.

The following is a list of the guests:—

DAÏS TABLE.

Sir Trevor Lawrence, Bart., K.C.V.O., V.M.H.
President, Royal Horticultural Society.

Right-hand side of the President.

Prince Alexander Mestshersky, of Smolensk Government, Russia
Sir Edward Durning-Lawrence, Bt., J.P.
The Rt. Hon. Sir Thomas B. Crosby, M.D., Lord Mayor of London
Baron von Ernsthausen
Sir J. R. Bradford, K.C.M.G., D.Sc., Secretary, Royal Society
Sir Thos. H. Elliott, K.C.B., Permanent Secretary, Board of Agriculture
Sir Arthur Church, K.C.V.O., F.R.S.
Sir Edward White, Chairman, London County Council
Maj.-Gen. Chas. Crutchley, M.V.O., Lieut.-Gov. Royal Hospital, Chelsea
The Mayor of Chelsea
M. M. de Vilmorin, Premier Vice-Président de la Société Nationale d'Horticulture de France
Mr. Sheriff Briggs
Lieut.-Col. D. Prain, M.A., F.R.S., V.M.H., Director, Royal Gardens, Kew
Dr. D. H. Scott, M.A., F.R.S., President of the Linnean Society
M. H. Vernieuwe, Directeur-Général de l'Office Horticole à Bruxelles
M. Firmin de Smet
M. Alaricus Delmard

Gallery side of the President.

The Rt. Hon. The Lord Desborough, K.C.V.O.
His Worship The Mayor of Westminster
Col. Sir George L. Holford, K.C.V.O., C.I.E.
Senhor M. Texeira Gomes, Portuguese Minister in London
Senhor Frederico R. Vidiella, Uruguay
Count Georges de Germiny
Sir Jeremiah Colman, Bart., J.P., D.L., V.M.H.
Baron Bruno Schröder
Le Comte Jos de Hemptinne
M. Tsan Yu Huan, Attaché Chinese Legation, London
Mr. Gerald W. E. Loder
Mr. F. A. Bevan, J.P.
Dr. P. Chalmers Mitchell, D.Sc., F.R.S., Secretary, Zoological Society
M. Jules Hye de Crom
Prof. Dr. A. Fischer de Waldheim, Director, Imperial Botanical Gardens, St. Petersburg
Dr. J. Troyanowsky, Moscow

TABLE 1.

Hon. J. H. Turner
M. L. Gentil
Major P. A. MacMahon, R.A., F.R.S.
Dr. C. G. Dahl
Mr. A. G. L. Rogers
Major P. Maud
M. Emile Duchesne
Mr. T. McRow
Rev. W. Twining
Mr. Charles C. Tudway, J.P.

TABLE 2.

Mr. John O. Hall
Prof. Urumoff
Mr. Arthur W. Sutton, J.P., V.M.H.
Prof. J. B. Farmer, D.Sc., F.R.S.
M. Firmin Lambeau
Sen. G. Roda
Baron d'Exaerde de Kerchove
Baron Albin Thaan
Mr. L. Duart Coel

TABLE 3.

Times
La Tribune Horticole
Morning Post
Die Gartenwelt
Standard
Le Jardin
Daily Telegraph
Journal of Horticulture
The Press Association
The Field

TABLE 4.

Sir Charles D. Rose, Bart.
Sir Daniel Morris, K.C.M.G., V.M.H.
Sir Wm. W. Portal, Bart., D.L., J.P.
Sen. V. Valvassori
Rt. Hon. Sir Edward Morris
Sir F. M. Hodgson, K.C.M.G.
M. Jules Nanot
The Hon. Sir N. J. Moore, K.C.M.G.

TABLE 5.

Sir Marcus Samuel, Bart.
Sir Edward D. Stern
Mr. J. F. W. Deacon, J.P.
Jonkherr W. T. C. van Doorn, M.P.
Mr. Pantia Ralli
Mr. R. Cory
Mr. J. K. M. L. Farquhar
Mr. Timothy A. Coghlan, I.S.O.
Major Sir Thomas Bilbe-Robinson
Captain Muirhead Collins

TABLE 6.

The Hon. John R. de C. Boscawen
Herr Otto Beyrodt
Mr. T. A. Dorrien-Smith
Heer E. H. Krelage
Herr Fitz Benary
Mr. W. Bateson, D.Sc., F.R.S., V.M.H.
M. Jules de Cock
Mr. Arthur H. Leveson-Gower

TABLE 7.

Gardeners' Chronicle
Revue Horticole
Country Life
The Garden
La Vie à la Campagne
Daily Mail
Garden Life
Daily Chronicle
Mr. J. W. Howe
Daily News
Daily Graphic

TABLE 8.

Mr. Herbert J. Greenwood, J.P., L.C.C.
Professor Boris Fedtschenko
Professor Ritzema Bos
M. R. P. Bonthuis
Mr. Robert Sydenham
Mr. J. W. Bradley, A.M.I.C.E.
Mr. W. R. Dykes
Mr. R. Brooman-White

TABLE 9.

Hon. J. A. Kenrick
Mr. W. T. Lawrence
M. Romain de Smet
Mr. J. Howard
Mr. W. Tatham Hughes
M. H. Graire
M. G. Debrie
Don Aristides Gutierrez
Dr. Antonio Fialko

TABLE 10.

Mr. F. Menteith Ogilvie
Mr. Walter Cobb
M. X. Lafosse
M. L. Henry
Heer J. K. Budde
Herr A. Brodersen
Mr. E. A. Ebblewhite, J.P., F.S.A.
M. Lucien de Cock

TABLE 11.

Mr. B. Hammond Tracy
Mr. A. T. Lawrence
Mr. R. Boxall
Mr. E. Bonnot
Mr. P. Dailledouze
Mr. J. Gurney Wilson, F.L.S.
Mr. G. Rowland Blades
Mr. H. Morgan Veitch
Mr. Elwanger
Mr. Peter Veitch
Mr. de Barri Crawshay

TABLE 12.

Mr. Geo. Paul, J.P., V.M.H.
M. A. Gravereau
Mr. W. Watson, A.L.S.
M. B. Nomblot
Mr. Arthur Turner
M. P. Guillot
Herr Adolf Koschel
Mr. Gurney Hill
M. J. B. Curez
Mr. G. Laing Paul
M. G. Croux
M. J. Pernet-Ducher

TABLE 13.

Sir John Barker, Bart.
Major W. Henry Thomas
Mr. Chas. du P. Chiappini
Dr. A. B. Rendle, F.R.S., F.L.S.
Mr. D. Houston
Mr. Geo. Bunyard, V.M.H.
Mr. A. W. Hill, M.A., F.L.S.
Mr. W. Botting Hemsley, F.R.S., F.L.S., V.M.H.
Mr. O. B. Cowley
Mr. Jos. Cheal
M. J. Moser
Mr. J. Charlesworth
Mr. Iceton

TABLE 14.

Mr. H. B. May, V.M.H.
Mr. W. Cuthbertson, J.P.
Mr. Geo. J. Ingram
Mr. T. Walter Ware
M. G. Truffaut
Mr. R. Hooper Pearson
Mr. Edward Goodyear
Mr. J. J. Giles, J.P.
Mr. W. Cranfield
Mr. Herbert May, Jun.
Mr. C. T. Druery
Mr. W. Nutting

TABLE 15.

Sir Everard F. im Thurn, K.C.M.G., C.B.
Mr. J. Gurney Fowler
Consul-General W. E. Pollet
Mr. Robert Emmet
Mr. Edward White
Mr. C. Sebag Montefiore
Sir Frederick Moore, M.A., V.M.H.
Sir Harry J. Veitch, V.M.H.
M. Albert Truffaut
Professor Dr. Emanuel Gross
Herr F. Seidel
M. Maurice Duguesnoy

TABLE 16.

Mr. W. A. Bilney, J.P.
Mr. N. N. Sherwood, V.M.H.
Mr. J. H. Beatson
Herr Paul Mauthner
Professor Otto N. Witt
M. Abel Chatenay
M. Charles Pynaert
Heer G. H. van Waveren

Mr. Edward Sherwood
M. P. de Vilmorin
M. P. Rivoire
Mr. Reginald Farrer, J.P.

TABLE 17.

Mr. C. J. Lucas
Mr. E. A. Bowles, M.A.
Mr. J. R. Loewe
Rev. J. Aikman Paton, B.Sc.
Mr. Arthur E. Clarke
Mr. Frank L. Durham
Rev. W. Wilks, M.A.
Mr. John Eagleton
Mr. C. G. A. Nix
Mr. Frank Rendell
Mr. W. Saunders
Mr. T. C. Huxley

TABLE 18.

M. M. P. Anderson
Alderman L. Foster
Mr. F. Arey
Dr. A. Henry, M.A., V.M.H.
Dr. B. Daydon Jackson
Professor F. Keeble, M.A., Sc.D.
Professor Percy Groom, M.A., D.Sc.
Mr. Gilbert Beale
Mr. W. G. Gardiner
M. H. Correvon
Rev. Bernard Hall, B.A.
Mr. Leonard G. Sutton

TABLE 19.

Mr. Arthur W. Paul
Herr P. Lambert
Herr Carl Lambert
Herr Nicolas Lambert
M. Alfred Lamesch
M. J. B. Croibier
Mr. W. J. Jeffries
Mr. John Green
Mr. A. G. Jackman
Mr. E. Woodhall
Rev. George Wheeler, M.A.
Mr. T. Want

TABLE 20.

Mr. W. O. Hiehle
Mr. W. H. de Wilde
Mr. Collard
Mr. Geo. Gordon, V.M.H.
Mr. W. T. Macoun
Mr. F. Griffith
Herr A. Raab
Mr. J. Gibson
Heer van Lennep
Mr. J. O'Brien, V.M.H.
Heer J. T. Wilke

TABLE 21.

The Hon. Robert Philp
M. Pierre Hoser
Mr. A. Delmar
Mr. A. T. de la Marc
Mr. E. G. Hill
Mr. Otto Mann
Mr. T. Hay
Mr. C. H. Totty
Mr. A. D. Webster
Mr. Marcellus A. Patten
M. Jules Ulrich

TABLE 22.

Mr. A. H. Pearson
Mr. Jas. Hudson, V.M.H.
Mr. C. R. Fielder, V.M.H.
Mr. J. F. Hudson
Mr. S. T. Wright
Mr. G. Woodward
Mr. G. Wythes
Mr. H. Somers Rivers
Mr. G. Reynolds
Mr. Jennings
Mr. John J. Cypher, V.M.H.
Mr. C. H. Curtis

TABLE 23.

Dr. Kurt Schechner
Herr Anton Umlauf
Herr Rudolf R. Schmidt
Herr Franz Frolik
Herr Louis Wolff
M. H. Fatzer
Mr. L. Messel

TABLE 24.

Mr. P. D. Williams
Rev. A. T. Boscawen
Sir Aston Webb, C.B., R.A.
Colonel Bernard Petre
Mr. H. Maxwell Lefroy, M.A., F.Z.S., F.E.S.
Mr. F. C. Stoop
Herr E. T. Witte
Mr. S. G. Shead
Mr. Arthur Yates
Mr. J. S. Bond
Mr. Edward Webb, J.P.
Dr. L. Späth

TABLE 25.

M. Pinguet Guindon
Mr. W. Fawcett, B.Sc.
Herr J. Mensing
M. Ch. Vuylsteke
M. A. Nonin
Mr. C. E. Pearson

TABLE 26.

M. E. Wartel
Major C. C. Hurst, F.L.S.
Mr. F. J. Chittenden, F.L.S.
Mr. E. A. Bunyard
M. René Barbier
Mr. J. B. Sowerby
Mr. F. Sander, V.M.H.
M. de Meyer
Herr F. C. Heinemann
Mr. Arthur S. Horne, B.Sc.
Mr. R. H. Curtis
Mr. Geo. Schneider

TABLE 27.

Mr. Algernon E. Aspinall
Mr. Gerald Hoghton
Mr. Arthur J. Gaskell
Mr. C. Herman Senn
Mr. J. A. Turner
Mr. H. J. T. Hooper
Mr. J. E. Younghusband

TABLE 28.

Mr. A. Kingsmill
M. R. Adnet
M. A. A. Peeters
M. O. Opoix
Dr. J. J. L. van Ryn
Mr. W. J. Bean
Herr W. Neubert
M. S. Mottet
Mr. A. W. Watkins
M. Lucien Linden
M. J. Sallier
Mr. Harry Letts

TABLE 29.

Mr. F. Gomer Waterer
Professor A. Buyssens
M. C. Page
Herr A. Siebert
Herr Karl Kunz
Mr. Donald MacDonald, F.L.S.
Heer R. A. van der Schoot

TABLE 30.

Mr. R. W. Wallace
M. Jules Closon
Mr. Peter Rudolph Barr
Mr. W. Hales
Mr. George Cuthbert
Heer J. de Graaff
Mr. N. F. Barnes
Mr. W. P. Thomson
Mr. J. W. McLeod
Mr. W. Howe
Mr. R. F. Felton

TABLE 31.

M. L. Chauré
Exchange Telegraph Co.
Mr. Leonard Barron
Florists' Exchange
Mr. W. Nicholson
London News Agency
Mr. Adolf Farenwald
Mr. Louis Dupuy
Central News
Mr. W. Poupart
Mr. Peter Lambert
Mr. George Monro

TABLE 32.

Mr. A. M. Walker
Mr. Frank Reader
Mr. H. G. Alexander
Mr. G. Tivey
Mr. J. Heal
Mr. Geo. Harrow
Mr. J. R. Jackson
Mr. J. Davis
Mr. Geo. H. Barr

TABLE 33.

M. Anatole Cordonnier
Mr. W. Crump, V.M.H.
Mr. H. J. Chapman
Mr. W. Allan
Mr. P. Blair
Mr. J. H. Goodacre
M. A. Kraus de Smet
Mr. A. Young

TABLE 34.

M. Van Bockxstaele
M. G. Vincke-Dujardin
M. Henri Martinet
Mr. J. Whytock
Mr. Owen Thomas, V.M.H.
Mr. D. Inglis
Mr. T. Lunt
Mr. T. Challis, V.M.H.
M. C. Maron

TABLE 35.

M. Jules Vacherot
Mr. J. W. McHattie
Herr H. M. Velders
Herr M. Buchner
M. B. Carriat
Mr. J. Whitton
Mr. J. W. Odell

TABLE 36.

Mr. Stuart H. Low
Mr. C. Bayer
Mr. Geo. Sneath, J.P.
M. Jean-Pierre Soupert
M. Arthur de Smet
Mr. C. Harman Payne
M. F. Cayeux
Heer G. van der Heede
M. Emile Lemoine
Mr. A. Mackellar, V.M.H.
Mr. Richard Vincent

TABLE 37.

Mr. M. J. R. Dunstan, M.A.
M. P. L. Lévêque
Mr. J. F. Gutteridge
M. Tivadar Nachez
Mr. S. Liddle
M. E. Turbat
Herr J. M. C. Hoog
Heer J. G. Ballego

TABLE 38.

Mr. Walter W. Naunton
M. A. Belin
Mr. W. Bull
Mr. J. S. Brunton
Mr. T. W. Turner
Mr. F. E. Weinholt
M. L. C. Baltet
M. H. Gilson

TABLE 39.

M. R. Chenault
M. L. Chenault
Heer B. Ruys
Mr. W. Bain
Mr. Geo. G. Stanton
Mr. T. H. Cook
Mr. T. May
M. E. Draps

TABLE 40.

Mr. A. M. Bullock
Mr. A. Chapman
Mr. T. Coomber, V.M.H.
Mr. C. Page
Mr. C. Dixon
Mr. F. Bedford
Mr. E. Beckett, V.M.H.
Mr. F. Perkins
Mr. A. Dye

TABLE 41.

Mr. Godseff
Mr. G. Summers
Mr. J. A. Petersen
Mr. A. Junge
Mr. W. Profittlich
Herr W. J. Beltz
Mr. Henry Dailledouze
Mr. Harry Papworth

MENU

Old Amontillado

Berncastler Doctor

Margaux, 1900

Veuve Clicquot, 1904
George Goulet Sec

Old Liqueur Brandy
Curaçao Justerini
Bénédictine

Croft's
Old Crusted Port

Old Liqueur Whisky

Perrier Apollinaris
Siphons

Still Lemonade

Hors d'Œuvre

Tortue Claire
Consommé Printanier

Darne de Saumon Sauce Norvégienne
Filets de Soles Suzanne

Poularde de Bresse

Selle d'Agneau de Galles
Haricots verts Princesse
Pommes Nouvelles

Sorbets Neigeux Forêt-Noire

Cailles en Cocotte
Salade de Romaine

Asperges Lauris Sauce Hollandaise
Délices de Fraises-Glacées Muscovite

Fromages variés

Dessert

Café

TOAST LIST.

"HIS MAJESTY THE KING."

"HER MAJESTY THE QUEEN, QUEEN ALEXANDRA, AND THE OTHER MEMBERS OF THE ROYAL FAMILY."

"THE ROYAL INTERNATIONAL HORTICULTURAL EXHIBITION, 1912."

Proposed by BARON VON ERNSTHAUSEN.
Response by SIR HARRY VEITCH, V.M.H., Director of the Royal International Exhibition, 1912

Violin Solo by MONSIEUR TIVADAR NACHEZ.

"OUR GUESTS FROM ABROAD."

Proposed by SIR TREVOR LAWRENCE, BART., K.C.V.O., V.M.H.
Response by MONSIEUR A. TRUFFAUT, Vice-Président de la Soc. Nat. d'Hort. de France.

Violin Solo by MONSIEUR TIVADAR NACHEZ.

"THE ROYAL HORTICULTURAL SOCIETY."

Proposed by HEER ERNST KRELAGE, President Dutch Bulb Growers' Society.
Response by SIR JEREMIAH COLMAN, Bart., Treasurer of the Royal International Hort. Exhibition, 1912.

Violin Solo by MONSIEUR TIVADAR NACHEZ.

"SIR TREVOR LAWRENCE, BART., K.C.V.O., President of the Royal Horticultural Society."

Proposed by MONSIEUR M. DE VILMORIN.

PIANIST, MR. S. LIDDLE.

After dinner the PRESIDENT rose to propose the loyal toasts. He said: Your Highness, my Lords and Gentlemen,—Beyond all question I believe that not on any occasion of their Majesties opening a show have they derived greater pleasure than when they opened the Royal International Horticultural Exhibition. The King was fortunate enough to gain some of the prizes, and we have with us to-night the gentleman—an excellent gardener—who won His Majesty's Cup, and a very fine cup it is. I almost thought he ought to have brought it here to-night so that it might have been passed round as a loving cup, but perhaps that would have involved serious delay. His Majesty and the Queen expressed their great admiration of the show, a feeling which I cannot help thinking must have been shared by every one who saw it. I am sure you will all receive the toast of their Majesties' health with the cordiality which it deserves.

The toast was honoured with the greatest enthusiasm.

BARON VON ERNSTHAUSEN proposed "The Royal International Horticultural Exhibition, 1912." He said: Mr. President, your

Highness, my Lords and Gentlemen,—The toast which I have the honour to propose is one which lends itself to the making of a great many points, but you need not be afraid that I shall labour it at any great length. Unfortunately for me, but fortunately for you, I have a very bad throat, so that I propose to say only a very few words. I think all those who have seen the Exhibition will agree that since the world began—I may say since Adam first learnt about the cultivation of apple trees—there has been nothing so interesting and beautiful as this Exhibition. The greatest credit is due to the organizers of the Exhibition, to the directors, and to the management, especially, I think, to Mr. Gurney Fowler, whose name I have the pleasure of coupling with this toast. My terms of reference expressly desire me to wish success to this Exhibition. That is a work of supererogation where success has already been achieved in so signal a manner as at Chelsea this year. That the Exhibition may be a success financially, as it is already in every other respect, is the desire of us all. I have the honour to propose success to the Royal International Horticultural Exhibition—a success it deserves in the very fullest measure.

Mr. J. Gurney Fowler, chairman of the directors, was to have responded, but owing to his heavy labours at the Exhibition he asked

Sir Harry Veitch, V.M.H., to do so for him. Having explained this, Sir Harry proceeded: I suppose there is no one, except those acting on the Board of Directors, who knows what the work of this Exhibition has been. It is only we who have been able to assist Mr. Gurney Fowler in his arduous task who can tell what real hard work that gentleman has had to perform. Early and late for weeks Mr. Gurney Fowler has toiled at his self-imposed labours. I hope they are now coming to an end, but there will remain the very pleasurable part of looking back on their successful issue; and I hope all who have come from overseas have enjoyed their visit to this country. Speaking for the Executive of this great Exhibition, I must say that we have been most happy in the gentlemen who have helped us. We have been most fortunate in having the Duke of Portland, K.G., for our President. Then, again, we have had a perfect Chairman of Jury in Mr. Leopold de Rothschild, C.V.O. We have an excellent Managing Director in our friend Mr. Edward White, who, I am glad to be able to say, is with us this evening; and there is one name I must not forget—a man who has done spade work for our Exhibition—our good friend Mr. S. T. Wright, of Wisley, who, when difficulties have arisen, has invariably known how to overcome them. In the name of the directors I desire to tender my hearty thanks to the President and Council of the R.H.S. for enabling us to welcome so many of our foreign friends here to-night, and to express the hope that they have enjoyed themselves since they came to our poor climate, and also the hope that it is not the last time we shall have the pleasure of receiving them in this Hall. It is quite true that our last International Exhibition was held forty-six years ago. I cannot, of course, venture to say when the next will be held. I cannot hope that I shall

be here to see it, but I am thankful to be here to-night, and that I am able to speak on behalf of the directors in thanking the Society for welcoming so many of our friends. When the last International Exhibition was held in this country it was a very small one compared with this. In Mr. Fowler's name, and in the names of the directors generally, I thank you for having so warmly received the toast. I can assure you it has given us great pleasure to do the work the Exhibition has involved. If we merit your approbation, and if you return to your homes feeling that you have enjoyed your visit and learnt something horticulturally, we are amply repaid for all we have done.

Sir Trevor Lawrence, Bart., proposed "Our guests from abroad." He said: "Your Highness, my Lords and Gentlemen,—This toast which I have to propose to you is, I think, one which will appeal to us all. The Royal Horticultural Society feels bound, and not only bound, but delighted, to give a most cordial welcome to our visitors from all parts of the world. I have had the pleasure of shaking hands with people from almost every country and clime, at all events of the Western habitable globe. Some of them I knew, many of them I did not know; but to one and all of them I wish to express my warmest tribute of thanks for having honoured our old Society by coming here to-night, and from my heart I can say that we are all very glad indeed to see them, and are only too pleased if they have found anything to admire in the great Exhibition. We hope they will carry back to their own country not only memories of British horticulture, but also of the very cordial welcome which the Royal Horticultural Society has given them. I remember perfectly well the International Exhibition of 1866. I remember much further than that. I remember coming up from the country as a boy from school to go to the Royal Horticultural Society's shows at Chiswick—shows which in those days were the finest things to be seen, as I believe our present R.H.S. fortnightly shows are the finest things of their sort to be seen now. The Royal Horticultural Society has passed through a great many vicissitudes. It has had its good days and it has had its bad days, as I fancy all such societies experience. But now in its old age —nearly 110—the Society has again won its way to prosperity—a prosperity which, I think, is reflected in the fact that the directors of the present International Exhibition have been able to get together a show which has been described by our visitors as almost the climax of horticulture. Our present prosperity is considered by some to be almost phenomenal. But I would remind you that if that be so our responsibilities have increased *pari passu*. Those who were at the International luncheon at Chelsea on Wednesday heard Mr. Runciman say that his Department had established a branch of horticulture. That, I think, is a matter for great congratulation. At the same time I am a little afraid Mr. Runciman may be looking to our Society to find the real sinews of war. However, we will not anticipate any depressing features of the scheme he dimly foreshadowed, and are

genuinely glad to acknowledge our debt of gratitude to him for recognizing horticulture at all. What I think is remarkable is the way in which the love of horticulture pervades every class of the community. In the poorer parts of London you will find that the people are always anxious to have window-gardens, showing their affection for plants and flowers, and I think that shows a most genuine love for horticulture throughout the length and breadth of the land. As to foreign competition, we have got to hold our own, not because we wish to get the better of our neighbours—far from it; but because we have got to work hand in hand with them in the interests of the horticulture of the whole world, and it is no easy matter for us.

Monsieur A. TRUFFAUT, Vice-Président de la Soc. Nat. d'Hort. de France, in reply said: Il me reste un double devoir à remplir: celui de remercier, au nom des membres étrangers du Jury, la Société Royale d'Horticulture de Londres, une des plus anciennes et la plus importante du monde, de la généreuse et cordiale réception qu'elle vous offre ce soir.

Il m'appartient aussi, au nom de la Société Nationale d'Horticulture de France, que j'ai l'honneur de représenter en l'absence de notre Président, Monsieur Viger, de rappeler les bons rapports qui existent depuis longtemps entre nos deux grandes Associations.

Nous n'avons pas oublié les dons de médailles et récompenses diverses que vous nous avez précédemment envoyées pour être attribuées lors de nos dernières expositions internationales. C'est pourquoi nous avons engagé nos horticulteurs de vous présenter quelques echantillons de nos cultures françaises, et qu'à notre tour nous vous avons fait parvenir un objet d'art dont vous avez bien voulu apprécier la valeur artistique et surtout les sentiments qui en ont inspiré l'envoi.

Je suis certain que ces échanges ne feront qu'augmenter encore les liens de sympathie qui existent depuis si longtemps entre nos deux grandes Associations nationales, pour lesquelles l'entente cordiale a toujours existé, mais que nous sommes heureux de souligner en ce moment où nos deux pays ont appris à se mieux connaître et s'estimer réciproquement.

Et nous mêmes les Français, nous serons heureux de vous recevoir à notre prochaine Exposition internationale de 1915, pour vous montrer à notre tour, nos roses, nos œillets, nos plantes annuelles, nos légumes, les productions florales du Midi et les gains nouveaux de nos semeurs, dans les genres Rosiers, Begonia, Œillets Hortensia.

Nous avons donc encore de belles fêtes en perspective et ainsi l'occasion de constater les nouveaux succès de notre grande famille horticole.

Heer ERNST KRELAGE, President Dutch Bulb Growers' Society, proposed "The Royal Horticultural Society." He said: Having been honoured with an invitation to propose the toast of the Royal Horticultural Society I did not for a moment hesitate in accepting it, as it enables me to express my sincere thanks for the kindness which has been bestowed upon me by the Royal Horticultural Society, not only

to-day, but also on many previous occasions in my quality of a honorary corresponding member. I hope I may be permitted to add a few words in connexion with the International Show which is responsible for our presence in London. It is a most unique advantage to assist at such a rare occurrence as an International Horticultural Exhibition in England, which till now has happened only once in a man's life, and consequently very appropriately may be compared with a total eclipse of the sun. The only exceptions to the rule appear to be Sir Trevor Lawrence, your President, and Sir Harry Veitch, both of whom have seen the horticultural sun eclipse twice—namely, in 1866 and again now—and, remarkably enough, being both just as young-hearted, if not quite so active, as they were forty-six years ago. It is, however, not my duty to speak about the Exhibition, although I am certainly entitled to refer to the relation between the Exhibition and the Royal Horticultural Society, for all who have the least knowledge of affairs are aware that the Exhibition would not have been possible but for the large-heartedness and liberality of the Society; and as is well known, the Royal Horticultural Society is always ready to make a sacrifice for horticulture. The glorious history of this the oldest of horticultural societies furnishes countless proofs thereof, and it is also well known that it had not attained its present prosperity before it came under the able management of the present President and Council, with Mr. Wilks as Secretary. In the period of their reign this beautiful hall has been built, the new trial garden established, the JOURNAL become a very important scientific periodical, and the fortnightly meetings developed into extensive flower shows. The leading men of the R.H.S. also gave the impetus to the great Exhibition which we have all admired. But giving the President and Council all the honour they deserve, I may say that they could not have obtained such marvellous results in any other country except England. There are other countries which may have more perfect horticultural trades organizations, more important horticultural export, better horticultural schools, and more perfect phytopathological services: I am proud to say that in all these respects we are pretty well equipped in Holland, but what neither we nor any other foreign country have, and never will have, is an institution like the Royal Horticultural Society of Great Britain. We cannot have it or try to imitate it, because it is based upon one of the most ideal qualities of the British people, from the millionaire to the man in the street, which is not found in nearly such a degree in any other country—namely, an intense and noble passion for flowers and plants, indeed for any of Nature's treasures; and it is also based on the high average standard of cultivation to which the British growers and amateurs have attained and which has never been surpassed anywhere else in the world. The Royal Horticultural Society has always exercised a mighty influence upon the development of horticulture in all its branches, and your foreign guests are the most sincere admirers of your work and institu-

tions. In proposing the toast of the Royal Horticultural Society I couple with it the name of Sir Jeremiah Colman, Bart.

Sir Jeremiah Colman, Bart., replying, said: Mr. President, your Highness, your Excellency, my Lords and Gentlemen,—When I glance around and see the many distinguished members of the Royal Horticultural Society I am filled with amazement that the Council should have invited me to reply on behalf of the thirteen thousand members of that popular and noble Society. To mention only two, the Englishman next on my right, Sir George Holford, is a gentleman whom you would like to have seen associated with this toast. We all know, however, that he is modest enough not to desire to be asked to make a speech, and doubtless the members of the Council were well aware that he would do sufficient to uphold the honours of the Society without being called upon to address you to-night. Most nobly has he performed his part in winning the most coveted trophy of the Exhibition—the King's Cup. Immediately on my left is a gentleman, Baron Bruno Schröder, who in this Horticultural Hall you would desire to have associated with this toast, because there is no one to whom we owe the possession of this hall more than to the late Baron Schröder. His successor, Baron Bruno, during the course of the dinner, has expressed his surprise that the Council have been able to provide such a good banquet. I expressed the view that his uncle was a far-seeing man, and that he foresaw the probability of entertaining the foreign and colonial visitors in such a hall and after such an exhibition, and had seen that ample kitchen accommodation was provided. Is it possible that he also, in the interests of our guests, took care that the acoustic properties of the hall should be of a character which rendered lengthy speeches useless? I should have liked to have dwelt upon the strenuous activities of the gentlemen around me in the interests of this Society, which is accomplishing a great and desirable work in encouraging and giving facilities for the indulgence of a science which Lord Bacon has described as the purest of human pleasures, and which appeals to our highest senses of taste, smell, and sight, and which affords enjoyment and relaxation to members of every class; also I should have liked to have spoken of the late Baron Schröder. We are all very sorry he is not still with us, because nothing would have pleased him better than to have seen so many different nations represented here. Speaking as Treasurer of the Royal International Horticultural Exhibition, I should like to emphasize the fact that it has been our great desire to show friendship to our guests who have come over to this country. We feel greatly indebted to them for having given up time to come over. I can assure them we are very highly appreciative of their presence, and that we wish to give them a most hearty welcome. Mr. President and Gentlemen, I will say no more, as time is rapidly passing, and after all I have only two themes—one is that of thanks to those who are present, and the other is thanks to the proposer for the way in

which he submitted this toast, and the company for the way it has been received.

Monsieur MAURICE DE VILMORIN proposed "Sir Trevor Lawrence, Bart., K.C.V.O., President of the Royal Horticultural Society." He said: I feel very keenly the honour conferred upon me to-day in having been asked to propose the toast of the health of our Chairman, Sir Trevor Lawrence, President of the Royal Horticultural Society. This honour has been conferred upon me, I feel sure, on account of your loving memory of my dear brother Henri, with whom I have so often shared the pleasure of taking part in so many of your Society's meetings. Warm-hearted and numerous are his friends here to-day, and I cannot forbear recalling how your Secretary once said of him, "You know we should always have considered him quite an Englishman, only that he spoke English so well." The long period of my connexion with horticulture possibly enables me to realize better than the younger men amongst us the wonderful achievement of the last quarter of a century's work in the development of the R.H.S. At the beginning of our President's term of office in 1885 the number of the Fellows was a very small, though honourable, roll. How different in number from the vast Society at present of thirteen thousand Fellows, all interested in different ways in the grand pursuit of horticulture! Of the financial position of the Society I need say nothing, as the magnificent welcome extended to us foreign visitors to-night speaks far more eloquently than any word of mine. Permit me also to congratulate the R.H.S. on the possession of such a grand and appropriate building as this is, to be the central home of the horticulture of the whole world. Material progress was bound to follow as a natural consequence of the wisdom and genial personal influence of your most excellent President, Sir Trevor Lawrence, who, I understand from the Secretary, is not, as so many presidents are, a mere figure-head, but one who never misses a meeting of your Council, and bestows the utmost personal care and superintendence on all, even the smallest details of the Society's work; and, as you all know well, details make up perfection, though perfection itself is far from being a detail. With such assiduous devotion to the Society's work bestowed by your President over a series of nearly thirty years, there is little wonder that he should have similarly infected your Council and all your officers as well, and have brought about as its result the present magnificent position and influence of the R.H.S. of this country. If I may be allowed one word in conclusion, it is this: that your President has also very quickly conquered all who have ever had the good fortune to be brought into personal contact with him—conquered them by the only force worth conquering with—the amiability and good grace of his charming personality. I have the greatest pleasure, therefore, in asking you all to join with me in drinking to the good health and long life of your President, Sir Trevor Lawrence.

Sir TREVOR LAWRENCE, in briefly responding, said he thanked the company with all his heart for the warmth with which they received

the toast. His heart was bound up with horticulture. He did not think there was any pursuit or any vocation more useful or more satisfying than horticulture.

The proceedings then concluded, and shortly afterwards the company separated.

GENERAL MEETING.

June 4, 1912.

Sir Daniel Morris, K.C.M.G., V.M.H., in the Chair.

Fellows elected (48).—R. Armitage, M.P., Colonel F. G. Atkinson, C.B., Mrs. C. Baring, T. Bolton, Mrs. H. Carr, Hon. Mrs. V. Cave, Mrs. C. J. Clerk, J. Cooke, W. Cowper-Calis, Mrs. J. H. Cuthbert, The Countess of Eldon, Mrs. Frederick, Hon. Mrs. W. H. Goschen, Miss C. Green, Lady Haliburton, Dr. W. Hammond, Mrs. C. Head, C. S. Holberton, Miss E. Howard, R. Hughes, Mrs. Price Jones, T. L. Kesteven, G. R. Khan, Lady Durning Lawrence, F. G. Lelen, Mrs. Littledale, Major F. L. Lloyd, R.E., Lady Macmillan, C. H. Magniac, G. E. Marten, J.P., Miss Matthews, Mrs. E. Middleton, Miss R. B. Morrison, Mrs. C. G. Mueller, C. W. Needham, Miss K. Pottinger, Mrs. P. T. Richards, W. A. Rome, Mrs. Taylor Sang, J. Simonds, Mrs. Singlehurst, Dr. R. Shingleton Smith, Mrs. C. Stafford, Mrs. D. Stuart, J. Temperley, J. Watt, Mrs. F. A. White, Mrs. H. Wright.

Fellows resident abroad (3).—J. K. M. L. Farquhar (U.S.A.), N. Lambert (Germany), H. Sachs (Germany).

Associate (1).—T. Standing.

The Eighth Masters Memorial Lecture on "Problems of Propagation" was given by Professor I. Bayley Balfour, F.R.S., V.M.H.

GENERAL MEETING.

June 18, 1912.

Sir John T. D. Llewelyn, Bart., V.M.H., in the Chair.

Fellows elected (79).—Mrs. Abraham, Miss M. Armytage, W. Ashton, Mrs. J. H. Astrop, Sir John Barker, Mrs. J. P. Bear, Mrs. H. N. Benjamin, Mrs. Bidwell, C. Braby, Rev. G. R. Brookes, Mrs. D. G. Bryce, Miss A. M. Burge, C. Burgess, Rt. Hon. Austen Chamberlain, M.P., Hon. Mrs. S. Coleridge, J. Colledge, Miss Cowlin, T. Ashley Crook, J.P., J. T. Daintree, Mrs. B. Day, A. de la Mare, Mrs. V. G. Dickson, Mrs. H. Dickmann, A. Edmonds, Mrs. Edwards, G. Elliot, Miss A. Eyre, Mrs. W. F. Fladgate, J. Floyd, Mrs. Alwyn Foster, Miss A. Foulerton, Mrs. A. F. Francis, W. R. Fuller, Mrs. H. W. Gibson, J. C. Grove, Mrs. B. Guinness, Mrs. S. E. Hall, T. J. Hanley, Mrs. Hawksley, A. Henderson, Hon. Nan Herbert, H. F. Higgs, Mrs. Hoare, A. Holford, D. E. Hutchins, Mrs. A . Jones,

Mrs. Kettle, Miss G. D. King, Miss M. C. King, H. Lammie, Mrs. H. Leech, Mrs. Luther, J. C. Mitchell, Dr. J. E. Molson, D. J. Morgan, Mrs. R. H. Norton, Miss Paget, J. Peed, E. E. Pescott, Mrs. Radford, W. C. Reynolds, Mrs. H. Dillon Ripley, A. G. L. Rogers, R. C. B. Rowe, H. H. Scott, Mrs. Seligmann, T. W. Simpson, A. M. Singer, C. Smith, Mme. Stadnitski, J. F. Symons-Jeune, F. Tessier, Mrs. Thorne, G. A. Tozer, Mrs. A. E. Tritton, J. J. Ward, C. B. Williams, B.A., F.E.S., Sir E. Chaning Wills, Bart., Mrs. Worringham.

Fellows resident abroad (8).—A. C. Buller (Cape Province), Mrs. Crocker (California), J. Dawes (N.S.W.), A. E. Day (Syria), L. Ferard (Paris), Mrs. W. R. Grimwade (Australia), G. Truffaut (Versailles), H. Vacherot (Boissy-St.-Leger).

Associates (4).—Miss C. Dexter, F. A. Hicks, Miss L. Mears, Miss Mercier.

A lecture on "Professor J. S. Henslow as Ecologist" was given by the Rev. Professor George Henslow, M.A., V.M.H. (see p. 220).

HOLLAND PARK SHOW.

July 2, 3, 4, 1912.

JUDGES.

ORCHIDS.

Chapman, H. J.
Crawshay, de Barri.
Fowler, J. Gurney
Shill, J. E.

ROSES.

Jefferies, W. J.
Mease, W.
Page Roberts, Rev. F.
Piper, T. W.

CARNATIONS.

Jennings, J.
MacLeod, J. F.
Turner, Arthur

BEGONIAS.

Blick, C.
Chapman, A.
Odell, J. W.

SWEET PEAS.

Bates, W.
Gordon, Geo., V.M.H.
Stevenson, T.

FRUIT AND VEGETABLES.

Challis, T., V.M.H.
Poupart, W.
Rollit, Sir Albert
Thomas, O., V.M.H.

HARDY HERBACEOUS.

Beckett, E., V.M.H.
Boscawen, Rev. A.
Cheal, J.
Hales, W.
Lynch, R. Irwin, V.M.H.
Notcutt, R. C.
Paul, G., V.M.H.
Shea, C. E.

ROCK, ALPINE, AND WATER GARDENS.

Bedford, A.
Bilney, W. A.
Bowles, E. A.
Divers, W. H.

Fig. 94. The R.H.S. Banquet to Foreign Horticulturists.

[To face p. cx.

Fig. 95.—The R.H.S. Banquet to Foreign Horticulturists.

FOLIAGE PLANTS.

Bain, W.
Baker, W. G.
Hudson, J., V.M.H.
Wythes, G., V.M.H.

OTHER FLOWERING PLANTS.

Howe, W.
Reynolds, G.
Turner, T. W.

PLANTS NOT INCLUDED IN ABOVE.

Bean, W. J.
Davis, J.
Ware, W. T.

HORTICULTURAL SUNDRIES.

Allan, A. R.
Basham, J.
Markham, H.
Woodward, G.

WIGAN CHALLENGE CUP FOR ROSES.

Dixon, C.
Mawley, E., V.M.H.
Wigan, A. L.

AFFILIATED SOCIETIES CHALLENGE CUP FOR HARDY FLOWERS.

Cuthbertson, W.
Green, J.
Pearson, C. E.

AWARDS GIVEN BY THE COUNCIL AFTER CONSULTATION WITH THE JUDGES.

The order in which the names are entered under the several medals and cups has no reference whatever to merit, but is purely accidental.

The awards given on the recommendation of the Floral and Orchid Committees will be found in their respective reports.

Gold Medal.

Sir Jeremiah Colman, Bart., V.M.H., Gatton Park (gr. Mr. J. Collier), for Orchids.

J. Gurney Fowler, Esq., South Woodford (gr. Mr. J. Davis), for Selaginellas and Orchids.

Messrs. James Carter, Raynes Park, for Japanese Garden and Sweet Peas.

Messrs. Charlesworth, Haywards Heath, for Orchids.

Messrs. W. Cutbush, Highgate, for Carnations.

Messrs. W. Cutbush, Highgate, for flowering plants and trained bushes.

Messrs. Dobbie, Edinburgh, for Sweet Peas.

Messrs. J. Hill, Lower Edmonton, for Ferns.

Messrs. H. B. May, Upper Edmonton, for Ferns.

Messrs. Paul, Cheshunt, for Roses.

Messrs. Wm. Paul, Waltham Cross, for Roses.

Mr. Amos Perry, Enfield, for Delphiniums, Ferns, &c.

Mr. Maurice Prichard, Christchurch, for herbaceous plants and water garden.

Messrs. James Veitch, Chelsea, for fruit trees in pots.

Messrs. James Veitch, Chelsea, for stove plants and Orchids.

Messrs. R. Wallace, Colchester, for Old English flower garden.

Coronation Challenge Cup.

Messrs. James Veitch, Chelsea, for fruit trees in pots.

Wigan Challenge Cup.

Mr. John Mattock, Oxford, for Roses.

Silver Cup.

Sir Randolph Baker, Bt., Blandford (gr. Mr. A. E. Usher), for Sweet Peas.

E. H. L. Davidson, Esq., Twyford (gr. Mr. Cooper), for Orchids.

S. Heilbut, Esq., Maidenhead (gr. Mr. G. Camp), for fruit trees in pots.

Messrs. Blackmore and Langdon, Bath, for Begonias and Delphiniums.

Messrs. G. Bunyard, Maidstone, for alpines, fruit trees, Roses, and herbaceous plants.

Mr. H. Burnett, Guernsey, for Carnations.

Messrs. B. R. Cant, Colchester, for Roses.

Messrs. Frank Cant, Colchester, for Roses.

Messrs. Clark, Dover, for herbaceous plants.

Messrs. Alex. Dickson, Newtownards, for Roses.

Messrs. Hugh Dickson, Belfast, for Roses.

Messrs. Hobbies, Dereham, for Roses.

Messrs. Jackman, Woking, for Clematis and herbaceous plants.

Mr. H. J. Jones, Lewisham, for Pelargoniums and Phlox.

Messrs. E. W. King, Coggeshall, for Sweet Peas.

Mr. J. MacDonald, Harpenden, for grasses showing methods of cultivation.

Messrs. Mansell & Hatcher, Rawdon, for Orchids.

Messrs. J. Peed, West Norwood, for Caladiums and flowering plants.

Messrs. J. Piper, Bayswater, for Dutch and water gardens.

Mr. G. Reuthe, Keston, for herbaceous plants, shrubs, and alpines.

Mr. L. R. Russell, Richmond, for stove plants, Ivies, Bamboos, &c.

Messrs. Sutton, Reading, for Sweet Peas.

Mr. Charles Turner, Slough, for Roses.

Messrs. James Veitch, Chelsea, for flowering plants and Bay trees.

Messrs. T. S. Ware, Feltham, for Begonias and hardy plants.

Silver-gilt Hogg Medal.

Messrs. Laxton Bros., Bedford, for Strawberries.

Silver-gilt Knightian Medal.

The Duke of Rutland, Belvoir Castle (gr. Mr. W. H. Divers), for fruit.

The King's Acre Nurseries, Hereford, for fruit trees in pots.

Silver-gilt Flora Medal.

Mr. W. E. Alsen, Denmead, for Sweet Peas.

Messrs. Barr, Covent Garden, for herbaceous plants and pygmy trees.

Mr. B. E. Bell, Guernsey, for Carnations.
Mr. J. Box, Lindfield, for hardy flowers and Sweet Peas.
Messrs. H. Cannell, Swanley, for flowering plants.
Messrs. J. Cheal, Crawley, for formal garden and hardy flowers.
Mr. C. Elliott, Stevenage, for alpines.
Mr. C. Engelmann, Saffron Walden, for Carnations.
Messrs. Gunn, Olton, for herbaceous plants.
Mr. F. A. Haage, junr., Erfurt, for Cacti.
Mr. Frank Lilley, Guernsey, for Gladioli.
Messrs. Stuart Low, Enfield, for Orchids.
Messrs. Stuart Low, Enfield, for Roses.
Mr. R. C. Notcutt, Woodbridge, for herbaceous plants.
Messrs. Carter Page, London Wall, for flowering plants.
Mr. George Prince, Oxford, for Roses.
Messrs. W. Wells, Merstham, for herbaceous plants.

Silver-gilt Banksian Medal.

The Countess of Ilchester, Holland House (gr. Mr. C. Dixon), for Cacti, &c.
Hon. Vicary Gibbs, Aldenham, for Pelargoniums.
W. W. Gott, Esq., Cornwall, for Malmaison Carnations.
Messrs. S. Bide, Farnham, for Sweet Peas.
Mr. C. W. Breadmore, Winchester, for Sweet Peas.
Messrs. James Carter, Raynes Park, for Begonias, Gloxinias, &c.
Mr. James Douglas, Great Bookham, for Carnations.
Messrs. W. Fromow, Chiswick, for Japanese Maples.
Mr. G. Lange, Hampton, for Carnations.
Mr. Robert Sydenham, Birmingham, for Sweet Peas.

Silver Knightian Medal.

Rev. L. C. Chalmers-Hunt, Willian Rectory, Hitchin, for Sweet Peas, Roses and vegetables.
The Halliford French Garden, Halliford, for vegetables.
Messrs. Stuart Low, Enfield, for Figs.

Silver Flora Medal.

M. Y. Green, Esq., Eynsford (gr. Mr. W. White), for Sweet Peas.
Sir George Holford, C.I.E., C.V.O., Westonbirt (gr. Mr. H. G. Alexander), for Orchids.
Messrs. R. H. Bath, Wisbech, for herbaceous plants.
Mr. C. Blick, Hayes, for Carnations.
Mr. Harry Dixon, Wandsworth, for Orchids.
Mr. S. W. Flory, Twickenham, for Orchids.
Messrs. John Forbes, Hawick, for Phloxes and herbaceous plants.
Messrs. G. Gibson, Bedale, for Delphiniums.
Messrs. Godfrey, Exmouth, for Canterbury Bells and herbaceous plants.
Mr. A. Ll. Gwillim, Sidcup, for Begonias.
Mr. H. Hemsley, Crawley, for alpines.
Messrs. Kelway, Langport, for Delphiniums.

Messrs. J. K. King, Coggeshall, for Sweet Peas.
Messrs. B. Ladhams, Southampton, for hardy herbaceous flowers.
Mr. H. Lakeman, Thornton Heath, for Carnations.
Messrs. Stuart Low, Enfield, for Carnations.
Mr. W. A. Manda, St. Albans, for foliage plants.
Messrs. Phillips & Taylor, Bracknell, for herbaceous plants.
Mr. R. Prichard, West Moors, for alpines.
Mr. C. Rassell, Bayswater, for rock garden, &c.
Messrs. S. Rochford, Broxbourne, for Araucarias.
Messrs. F. Smith, Woodbridge, for Phloxes and herbaceous plants.
Messrs. G. Stark, Great Ryburgh, for Sweet Peas.
Messrs. J. Waterer, Bagshot, for Yews.
Mr. J. D. Webster, Chichester, for Sweet Peas, Roses, and Carnations.
Messrs. Whitelegg & Page, Chislehurst, for herbaceous plants, &c.
Castle's Shipbreaking Co., Millbank, for garden furniture.
Mr. T. Crowther, Fulham, for garden ornaments.
Messrs. Liberty, Regent Street, for garden pottery.

Silver Banksian Medal.

The Countess of Ilchester, Abbotsbury, Dorset (gr. Mr. Kempshall), for cut shrubs.
Mr. J. Bruckhaus, Twickenham, for Aspidistras, Palms, &c.
Mr. H. H. Crane, Highgate, for Violas and Violettas.
The Guildford Hardy Plant Nursery, Guildford, for Roses.
Messrs. Jarman, Chard, for Centaureas, Sweet Peas, and Pelargoniums.
Messrs. Mallett, Cheddar, for Lilies, Spiraeas, &c.
Messrs. Pulham, Elsenham, for herbaceous and alpine plants.
M. H. Vacherot, France, for new Carnations.
Messrs. H. Freeman, Sutton, for rustic work.
The Leyton Timber Co., Leyton, for rustic work.

Bronze Flora Medal.

Messrs. Bees, Liverpool, for hardy flowers.
Messrs. Carlton-White, New Bond Street, for Box trees.
Messrs. W. Fells, Hitchin, for rock plants.
The Misses Hopkins, Shepperton, for hardy flowers and alpines.
Messrs. Rich, Bath, for hardy flowers.
Mr. V. Slade, Taunton, for cut blooms and plants.
Messrs. Thompson & Charman, Bushey, for perennials.

GENERAL MEETING.

JULY 16, 1912.

Mr. JAMES HUDSON, V.M.H., in the Chair.

Fellows elected (56).—Mrs. F. J. Abbott, W. G. Bateman, S. E. Bayley, J. H. Blair, Mrs. Blundell, Mrs. R. J. Boyle, H. F. Browell,

G. Butler, Lady Darley, Major-Gen. H. W. Duperier, W. G. Eastham, G. Fenwick-Owen, F. W. Flinders, Mrs. W. B. Gladstone, Madame E. Goiran, G. Goldspink, Mrs. D. Hall, T. Hay, W. F. Heathcote, C. Higgins, A. B. Hodge, R. Hogg, Mrs. J. Hopkinson, Hon. Mrs. Cecil Howard, W. P. Jones, Mrs. J. H. Kaye, G. A. Knowlson, Lady Octavia Legge, J. S. Lewis, Felicia, Countess of Lindsey, Mrs. W. Martin, S. T. Martin, G. E. Meakin, J. H. Meakin, Mrs. Metcalfe, Mrs. P. F. Miller, F. J. O. Montagu, Mrs. F. J. O. Montagu, C. H. Moore, H. P. Mosley, C. O. Naftel, Mrs. T. R. Nicholson, A. C. Norton, F. Oglesby, C. Oliver, Miss E. H. Pease, M. H. Tagg, Sir William T. Taylor, Lady Tennyson, F. Stockdale Toulmin, R. O. Waite, Sir James Walker, C.I.E., J. H. Walker, Mrs. Walton, W. J. Whetnall, E. Wood.

Fellows resident abroad (5).—J. Bidencope (Australia), T. Cardwell (New Zealand), H. D. Chatterjee (India), Dr. R. K. Seth (India), Robert Seth (India).

A lecture on "The Flowers of Apples and their aid in Identifying Varieties" was given by Mr. E. A. Bunyard (see p. 234).

DEPUTATION TO THE LEAMINGTON AND COUNTY FLOWER SHOW, 1912.

A deputation consisting of Mr. J. Gurney Fowler (Treasurer of the R.H.S.), Mr. H. B. May, V.M.H., Mr. C. G. A. Nix, and the Assistant Secretary, visited the Leamington Flower Show on July 24, 1912, at the invitation of the Chairman (Mr. Alderman A. Holt) and the members of the Committee, and made R.H.S. awards to the exhibits. The deputation were most kindly received, and everything possible was done to make the visit a pleasant one. On the eve of the show Mr. Alderman Holt and Mrs. Holt entertained them at dinner at their private residence—Oaklands, Kenilworth Road—some members of the Leamington Committee having been also invited to meet them. The cordial hospitality of the host and hostess afforded a memorable evening.

The show had many notable exhibits, the stove and greenhouse groups being especially attractive. The deputation were a little disappointed that the residents of Leamington were not exhibiting as largely as might have been expected in such an important town, and express the hope that amateur growers will do more in future to compete for the very munificent prizes offered. They will thus be assisting in establishing the show as a permanent annual event, which will produce a highly desirable influence in the interests of local horticulture. After luncheon had been partaken in the marquee, the deputation returned to London.

The pleasure of the visit was considerably heightened by Mr. Gurney Fowler motoring the deputation to and from Leamington. The outward journey was made via St. Albans, and the return via Stratford-on-Avon and Banbury.

The following is a list of the awards:—

Gold Medal.

To Sir G. H. Kenrick, Bart., Edgbaston (gr. Mr. J. V. Macdonald), for a group of plants.

To Messrs. J. Veitch, Chelsea, S.W., for stove and greenhouse plants.

To Messrs. J. Cypher, Cheltenham, for a group of plants.

Silver-gilt Knightian Medal.

To His Grace the Duke of Portland, K.G., Welbeck Abbey (gr. Mr. J. Gibson), for fruit.

Silver-gilt Flora Medal.

To the Misses Robinson, The Newlands, Leamington (gr. Mr. A. J. Friend), for a group.

To Mr. W. Vause, Leamington, for a group of plants.

To Messrs. J. Cypher, Cheltenham, for stove and greenhouse plants.

To Messrs. Gunn, Olton, for Roses.

To Mr. Charles Wall, Bath, for Carnations.

To Messrs. Young, Cheltenham, for Carnations.

Silver-gilt Banksian Medal.

To Alfred Holt, Esq., J.P., Leamington (gr. Mr. J. Fisher), for a group.

Silver Knightian Medal.

To H. Andrews, Esq., Toddington Manor, Winchcombe (gr. Mr. J. R. Tooley), for vegetables.

To Mr. J. C. Warr, Leamington, for vegetables.

To Mr. G. H. Wilkins, Leamington, for vegetables.

To Mrs. W. E. Everett, Sherborne House, Leamington (gr. Mr. E. Allaway), for fruit.

Silver Flora Medal.

To C. C. Shaw, Esq., Thornbank, Leamington (gr. Mr. W Bartlett), for a group.

To Messrs. W. Lowe, Beeston, for Roses.

To Messrs. Gunn, Olton, for hardy flowers.

To Messrs. Dicksons, Chester, for hardy flowers.

To Messrs. W. H. Simpson, Birmingham, for Sweet Peas.

To Messrs. Aldersey and Marsden Jones, Tilston, for Sweet Peas.

To Messrs. C. F. Waters, Balcombe, for Carnations.

To Mr. T. Jones, Bryn Penylan, Ruabon, for Sweet Peas.

Silver Banksian Medal.

To A. Cay, Esq., Woodside, Kenilworth (gr. Mr. R. Denton), for ferns.

To Mr. Frank Bouskell, Market Bosworth, for hardy flowers.

To King's Acre Nurseries, Hereford, for Roses.

Bronze Knightian Medal.

To Mr. T. Noon, junr., The Square, Stockton, for vegetables.

To Mr. J. Wright, 45 Guy Street, Warwick, for vegetables.

To Mr. G. Deakin, Hay Hall, Hay Hills, Birmingham, for vegetables.

GENERAL MEETING.

July 30, 1912.

Mr. F. J. Chittenden, F.L.S., in the Chair.

Fellows elected (54).—J. A. Allwood, J. W. C. Basnett, G. Blackmore, J. P. Brawn, W. T. Brown, F. M. Buck, Miss Maud Burdett, T. R. Byers, B. F. Casson, H. Chapman, Mrs. R. F. Cobbold, Lady Cockburn, Miss C. E. Craig, H. J. B. Craven, H. C. Crouch, H. Dawson, Miss W. B. Deering, B. A. Gage, F. N. Grant, R. Hamnett, G. Harris, J. Harrison, J. E. Hawkins, C. H. Higham, Akroyd Hyslop, H. V. Jones, W. Kirby, M. Knight, R. Lock, Miss H. Lowenfeld, Captain Sir Mervyn Manningham-Buller, Bart., C. J. Mapley, Lady Martindale, Arthur H. Mee, Mrs. R. Nivison, O. J. Osborne, Mrs. P. Phipps, A. W. Pickard-Cambridge, M.A., W. T. Price, R. E. Richardson, R. Robertson, H. P. Short, Bryan Smith, J. J. Strawbridge, H. Taylor, P. D. Thomson, Mrs. A. Ure, A. J. Voisin, F. Walton, Donald Watson, Miss E. L. Whittaker, F. A. Williams, J. M. Williams, R. Wright.

Fellow resident abroad.—C. M. C. Carne (India).

A lecture on "The Pollination and Setting of Fruit Blossoms" was given by Mr. Cecil H. Hooper, M.R.A.C. (see p. 238).

GENERAL MEETING.

August 13, 1912.

Mr. James Hudson, V.M.H., in the Chair.

Fellows elected (29).—Laura Lady Airedale, F. W. C. Bill, E. Bradfield, T. W. Brayshawe, H. G. Dorrett, C. Flint Drake, Miss Eyssen, Mrs. Eyssen, C. Farman, J. B. Garrett, A. Gray, W. Hall, C. Henchcliffe, E. T. R. Hoare, F. W. Humphries, C. A. Jardine, W. C. Mawson, W. C. Mayes, F. Palmer, C.I.E., J. H. Palmer, Mrs. K. L. Pearson, Miss A. A. E. Puxley, Mrs. Robinson, Miss V. Shakspeare, H. Sleightholme, G. Spalding, Mrs. G. Spalding, Lady Sutherland, E. C. Wood.

Fellows resident abroad (3).—Miss N. L. Corry (Spain), H. W. Dalton (Auckland, N.Z.), H. H. Davey (Australia).

A lecture on "The Rock and Water Garden" was given by Mr. Pulham, junr. (see p. 225).

SHREWSBURY SHOW, AUGUST 21, 1912.

The Council sent a non-competitive exhibit of grapes from Wisley to the above Show. It attracted an immense deal of attention, and the Society's official was kept busy throughout the Show answering inquiries concerning the relative merits of the several varieties shown, points of cultivation, &c. The exhibit consisted of a quite unique collection of twenty-five varieties, cut from the vineries of the Society at Wisley. When the glasshouses at Wisley were first erected it was decided that a thoroughly representative collection of grapes should be grown, and three divisions in a span-roofed range were set apart for the purpose. Not only were the best known and most popular varieties planted, but many of the little known ones as well. At least twelve out of the twenty-five that were shown at Shrewsbury came under the latter category. The idea of the Council was to create a taste for some of the finest flavoured grapes known, many of which, on account of their size or colour, are not popular from the exhibitors' standpoint. The results that have been obtained have fully justified this departure in grape growing, as is borne out by the increasing demand made from year to year for vine eyes for propagating purposes, both by trade growers and for private gardens as well. The following are some of the little grown grapes shown by our Society at Shrewsbury, viz.: 'Lady Hastings,' a very fine black Muscat-flavoured grape, which developed as a sport from 'Muscat Hambro'' at Melton Constable, the Marquis of Hastings' seat in Norfolk. Mr. Shingler, the gardener there, it should be noted, won the challenge trophy offered by the Shrewsbury Society, being placed first on no fewer than four occasions. 'Prince of Wales,' another remarkable new grape, was also included. It originated in Scotland, as a sport from 'Mrs. Pince'; it is an imposing-looking grape in every respect. 'Black Prince,' a good grape that is now seldom seen, was in fine order. Of white grapes there are many varieties too little known, even in private gardens. These include a unique trio which originated at Dalkeith Palace Gardens, the residence of the Duke of Buccleuch, when Mr. Wm. Thomson was gardener there: these are the 'Duchess of Buccleuch,' one of the finest-flavoured white grapes known; the 'Duke of Buccleuch,' a handsome grape with huge berries; and 'Golden Champion,' with somewhat similar characteristics. Both the 'White Frontignan' and 'Mrs. Pearson' were also included, the latter one of the many fine grapes raised at Chilwell, Notts, by the late Mr. J. R. Pearson. 'Lady Hutt,' raised at Appley Towers, Isle of Wight, by Mr. Miles, gardener there to Lady Hutt; this is the finest white grape for keeping into the New Year. 'Chasselas Napoleon,' a grape of French origin, was represented in fine character. Of red grapes, actually red when fully ripe, there are two that stand in the front rank from point of flavour: these are 'Muscat Champion,' a grape that was raised at Dalmeny, the Scottish residence of the Earl of Rosebery; it has large bunches and huge berries, which in point of flavour have all the good

qualities of those well-known grapes, 'Black Hambro'' and 'Muscat of Alexandria.' The other is the 'Grizzly Frontignan,' a very old variety, but of the finest flavour and one that forces well. Of grapes that are better known the following were staged, viz.: 'Bowood Muscat,' 'Foster's Seedling,' 'Buckland Sweetwater,' 'White Tokay,' 'Trebbiano,' and 'White Syrian.' Of black grapes the well-known 'Black Hambro',' 'Muscat Hambro',' 'Madresfield Court,' 'Appley Towers,' 'Alnwick Seedling,' and 'Gros Maroc,' with the comparatively new grape, 'Directeur Tisserand.'

A large gold medal was deservedly awarded to this magnificent exhibit, and Mr. Wright is to be specially congratulated, not only for the success of this exhibit, but also for the grand lesson in cultivation which may always be learnt in the grape-houses at Wisley.

GENERAL MEETING.

August 27, 1912.

Mr. E. A. Bowles, M.A., F.L.S., in the Chair.

Fellows elected (9).—R. Menpes Aitken, Sir George Alexander, Sir Fielding Clarke, Miss A. J. Dickinson, Mrs. H. F. Dupuis, W. R. Griffiths, J. G. C. Huntley, A. Irving, J. Laidler.

Fellows resident abroad (2).—H. Sherman Adams (U.S.A.), Henry G. Cooper (Canada).

A lecture on "Present-Day Water Lilies" was given by Mr. James Hudson, V.M.H. (see p. 249).

SCIENTIFIC COMMITTEE.

MAY 14, 1912.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and twelve members present.

Irises.—It was reported that the Council had awarded a Certificate of Appreciation to Mr. W. R. Dykes, M.A., for his work with the Irises which he exhibited at the last meeting of the Committee. (See p. xlii.)

Arsenical Poisoning.—Dr. Voelcker said that he had ascertained that the source of the arsenic in the water referred to at the last meeting was weed-killer. (See p. xli.)

Tulips with Fimbriated Edges.—Messrs. Pearson, Lowdham, sent two Tulips having the perianth segments much cut along the edges. The abnormality occurred among *T. Gesneriana* and 'Margaret.' The plants had been marked so that their behaviour next season may be ascertained. One or two other similarly cut-petalled plants have been reported this season.

Hybrid Orchid.—Mr. O'Brien, V.M.H., showed from Mr. E. F. Clark, of Evershot, Dorset, a flower of an Orchid raised by crossing *Laelia cinnabarina* and *Laeliocattleya* × 'G. S. Ball.' The latter is a hybrid between *Laelia cinnabarina* and *Cattleya Schröderae*. The flower was an improved *Laelia cinnabarina*, large and more open in the lip, but four of the pollen masses were large and four not quite so large, thus differing from both *Laelia* and *Cattleya*. Mr. Clark proposed to name the hybrid *Laeliocattleya* × 'Cinnabal.'

Primulas.—Professor I. Bayley Balfour, F.R.S., showed the following Primulas: *P. Faurei* (Franch.) from mountains of Japan, a plant with rose-coloured flowers freely produced, and leaves with golden farina below; *P. tibetica* (Watt), a dwarf plant with rose flowers allied to *P. involucrata* and native of the Tibetan highlands; *P. Reedii* (Duthie) (*Botanical Magazine*, 6961), a fairly well-known and beautiful pale violet species, not quite hardy, from Kumaon, introduced in 1885; *P. malvacea* (Franch.), from Yunnan, allied to *P. cortusoides* and having mauve flowers in two or three superposed umbels; *P. deflexa* with bluish-lilac flowers, rather small but in dense clusters and very sweetly scented; *P. membranifolia* (Franch.) with violet-coloured flowers, a native of Yunnan; *P. uniflora* (Klatt) with very pale violet flowers (on a two-flowered scape in this instance) from the Sikkim Himalaya; *P. pulchelloides* (Balfour), with rather large, beautiful, violet-coloured flowers, similar in appearance to *P. pulchella*, but nearly allied to *P. nivalis*, a native of China; and *P.* × 'Edina' (*P. Beesiana* × *P. Bulleyana*), a beautiful hybrid with salmon-coloured flowers. Botanical Certificates were recommended to the last five plants.

Scientific Committee, June 4, 1912.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, with fourteen members present and Mr. J. A. Alexander, visitor.

Odontioda × 'Carmen.'—Mr. de Barri Crawshay sent this hybrid between *Cochlioda Noezliana* and *Odontoglossum nebulosum* showing characteristics of both parents. Hybrids with the latter plant as one of the parents are scarce, and a Certificate of Appreciation was unanimously recommended to Mr. Crawshay.

Afzelia quanzensis.—Mr. Holmes, F.L.S., showed a pod and seeds of this African tree, the seeds of which are half-black, half-scarlet.

Botanical Certificates.—Professor I. Bayley Balfour exhibited the following new or uncommon plants: *Oxytropis yunnanensis* Franchet, (bearing deep-blue flowers), *Saxifraga majuscula* (very closely allied to *S. Brunoniana*, but much larger in all its parts), *S. diversifolia* var. *foliata* with marked veining of the ovate leaves, *Primula* × 'Edina' (which received a Botanical Certificate at the last meeting), *Senecio Lyallii*, Hook f. (with yellow flowers about 1½ inch across, from New Zealand); *Aster likiangensis* Franchet (with large, deep-blue flowers about 2 inches in diameter on stalks 3 inches long, from Yunnan, a very beautiful little plant); *Primula* × 'Inverleith' (*P. Bulleyana* × *P. pulverulenta*), a plant much in the way of *P.* × 'Edina,' but a shade deeper in colour and more robust in habit. Botanical Certificates were unanimously recommended for the last three plants.

Variation in Sweet Peas.—Mr. Cuthbertson brought examples of Sweet Peas, which he thought showed reversion to original forms. (1) A rich ruby-coloured unnamed variety produced waved flowers on normal plants, i.e., plants having waved leaves. Two plants of the same variety with perfectly plain leaves, like the leaves of the old type, had produced perfectly waved flowers with open keels. (2) In the white waved variety ('Etta Dyke'), in the waved cream variety ('Dobbie's Cream'), and in the pink-and-white bicolor ('Mrs. Cuthbertson') he had found deep purple-flowered plants—one in a thousand, perhaps—giving a colour approaching the colour of the wild Sweet Pea, but retaining the waved formation.

Sweet Pea with leafy tendrils.—Mr. Cuthbertson also showed some Sweet Pea leaves with some of the tendrils becoming leafy, the result of high cultivation.

Scientific Committee, June 18, 1912.

Mr. J. W. Odell in the Chair, and eight members present.

Pseudobulbs in Inflorescence.—Mr. O'Brien, V.M.H., drew attention to a plant of *Oncidium abortivum* (or *O. heterantheum*) shown by Sir Trevor Lawrence, K.C.M.G., V.M.H., bearing on the many-flowered inflorescence some well-developed pseudobulbs, each with two or three flowers.

Thelymitra sp.—A terrestrial orchid from Tasmania was also shown

which proved to be a species of *Thelymitra*, probably *T. carnea*, with pinkish flowers, rarely seen in gardens.

Polygonum sacchaliense variegated.—Sir Everard im Thurn sent from Scotland leaves of *Polygonum sacchaliense* showing broad yellow lines on each side of the mid-rib, and other yellow marks. The plant had been cultivated for several years in the garden, but had not previously shown any signs of variegation.

Mulberry.—Mr. Luxmoore of Eton wrote regarding a mulberry in his garden which showed a tendency towards dioecism. The staminate flowers were all upon one part of the tree, with but few pistillate ones among them; the pistillate flowers were mostly upon the other branches, and the separation of the two forms of flower was almost complete upon the different parts of the tree. The Rev. W. Wilks said that a tree in his garden always produced the two forms on separate branches, and the leaf-colouring was quite distinct and had been so for many years. Mr. Hales, A.L.S., said the same was true of two trees in the Chelsea Physic Garden, and was constant. It would be of interest to see the behaviour of plants raised from cuttings from the distinct parts of the trees.

Delphinium sporting.—Mr. Chittenden showed a piece of an inflorescence of a *Delphinium* from Wisley bearing blue flowers, the great part of the inflorescence having produced white ones.

Precocious seedling orange.—Mr. Manson, of Egypt House, London, E.C., sent a seedling orange which bore a terminal flower within one year of the sowing of the seed, a very unusual occurrence.

Scientific Committee, July 16, 1912.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and seven members present.

Delphinium consolida sporting.—Mr. Hales, A.L.S., showed inflorescences of *D. consolida* with all the flowers on one side white. They had appeared in a bed of the ordinary *D. consolida* at Chelsea where no white forms had been seen before.

Virescent Delphinium.—Mr. F. Paton of Dulwich showed inflorescences of a blue garden form of *Delphinium*, with all the flowers virescent, the foliose character of the parts (the stamens were not affected) varying in degree. In some, the carpellary leaves were still folded and closed at their edges, the ovules being represented by the serrate margins of the folded edges: in others they were quite open.

Plants injured by fumes from smelting works.—Sir John Llewelyn exhibited leaves of a number of different plants from cottage gardens in the Swansea district showing very serious injury, in the form of dead margins and patches. This injury had appeared simultaneously with the introduction of a new method of extracting zinc from its ores in the neighbourhood, and it was thought that probably the greater volume of fumes emitted from the stacks, and possibly a difference in

the composition of the fumes were accountable for the unusual damage. The specimens were referred to Dr. Voelcker.

Variation in Black Currant Boskoop Giant.—Mr. Chas. Pearson sent shoots of black Currant 'Boskoop Giant' to illustrate a variation which had suddenly arisen in several localities. In the sport the leaves become much more dentate and the bushes fail to fruit. Sometimes only a portion of the bush is so affected, but frequently the whole, and in one plantation 50 per cent. of the bushes showed the variation. The Committee would welcome any observations that would throw light upon the phenomenon. It has been suggested that possibly hard pruning may have brought about the result, but there is no record so far of recovery to the normal form.

Eria rhyncostyloides.—A botanical certificate was unanimously recommended to this beautiful, though small-flowered Orchid, native of Java, exhibited by Sir Trevor Lawrence, Bart., V.M.H.

Certificate of Appreciation.—A Certificate of Appreciation was recommended to Messrs. Charlesworth, Haywards Heath, on the suggestion of the Orchid Committee, for work done in raising *Odontonia* × 'Edna,' exhibited at Holland House Show. The plant is a hybrid between *Miltonia Warscewiczii* and *Odontoglossum Wiickeanum*, and has white flowers blotched with brownish-orange.

Scientific Committee, July 30, 1912.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and eight members present.

Injury from smelter fumes.—Dr. Voelcker, M.A., reported that the leaves sent to him from the last meeting were damaged by smelter fumes, and probably by hydrochloric and sulphuric acids in the fumes. Zinc and manganese were also present.

Hybrid Orchid.—Mr. O'Brien, V.M.H., drew attention to a hybrid Orchid, *Brassocattleya* × 'Thetis,' shown by Messrs. J. Veitch. It was raised between *Brassavola Digbyana* and *Cattleya Aclandiae*, but practically all the spotting of the latter species had been eliminated by the cross.

Caterpillars on Hops.—Mr. Holmes, F.L.S., remarked upon damage done to Hops by the larvæ of the peacock Butterfly, *Vanessa Io*, in Herefordshire; *Vanessa C-album* frequently damages them, but he had no doubt whatever that in this case *V. Io* was the culprit.

Mimulus moschatus almost scentless.—Mr. Hill, M.A., showed specimens of *Mimulus moschatus* to draw attention to the almost scentless condition of the plants. It would appear that under certain cultural conditions this plant fails to produce in any great quantity the essential oil to which its characteristic odour is due.

Delphinium macrocentron.—Mr. Bartholomew, of Reading, sent a specimen of this uncommon species of *Delphinium* from his garden. It is a native of Uganda and is somewhat poorly figured in *Bot. Mag.* t. 8151.

Scientific Committee, August 13, 1912.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and four members present.

Black Currants sporting.—Messrs. J. R. Pearson considered that "reversion" in Black Currants was not due to pruning. A letter on the same subject was read, in which the writer suggested that forcing by too much manure or too hard pruning was the cause of the "throw back" in Black Currants, and stated that the trouble is common amongst the Worcestershire growers.

Hazel.—Mr. O'Brien, V.M.H., showed Hazel Nuts with very large foliaceous bracts, a condition he had found fairly common in the neighbourhood of Haywards Heath.

Primula pycnoloba.—Messrs. J. Veitch, Chelsea, showed a new Western China *Primula*, *P. pycnoloba*, a species with small, dark purple flowers, very large sepals, and foliage resembling a *Megasea*.

Deinanthe.—Mr. Bennett-Poë, M.A., showed open flowers of the genus *Deinanthe*; the flowers are a deep blue, somewhat like *Meconopsis Wallichii* in form.

Scientific Committee, August 27, 1912.

Mr. A. W. Hill, M.A., F.L.S., in the Chair, and eight members present.

Sweet Peas diseased.—Mr. Odell reported as follows: "The specimens from Suffolk submitted to the Committee were damaged by the 'Streak' disease, due to *Thielavia basicola*. Many of the leaves and parts of the stem had also patches of *Botrytis cinerea* growing on them. The roots were poorly developed, and showed signs of some check earlier in the season, probably caused by overwatering in the early summer. As a method of preventing the attack, deep and early autumn cultivation of the soil intended for next season's crop of Sweet Peas is recommended; also a very moderate use of organic manure, thin seeding, and frequent use of the Dutch hoe in place of watering during early droughts."

Epidendrum laterale.—Mr. O'Brien, V.M.H., showed for Mr. Neal, of Penarth, a plant of *Epidendrum laterale* (Central America), and remarked that the inflorescence is produced on a rudimentary pseudo-bulb, as in *E. Stamfordianum* (probably the only similar case), a peculiarity that seems to show that the normal mode of flowering is from the base of the mature pseudo-bulb. A Botanical Certificate was awarded to this plant on the proposition of Mr. O'Brien.

Mummy Pea.—Mr. A. Sutton showed a series of photographs illustrating several crosses with the so-called Mummy Pea, *Pisum umbellatum*.

Lily fasciated.—Mr. Bowles presented a remarkable photograph of *Lilium candidum* showing a fasciated double form, a condition figured in Dr. Masters' *Teratology*.

Armeria abnormal.—Mr. Van der Weyer sent specimens of Thrift with abnormal pollen and petals.

Variation.—Rev. Professor Henslow, M.A., wrote with reference to non-scented Musk, stating it to be a condition due to the cold and wet weather. He also drew attention to the tendency to variegation in *Aspidistra* when removed from a partly shaded position to the full light of a conservatory.

Pear with axial growth.—Mr. Ockenden sent a Pear with elongated axis, showing the formation of three fruits, as a result of the elongation. Messrs. Bunyard sent a drawing of a Pear fruit showing a similar elongation, resulting, however, in a tuft of leaves beyond the fruit.

FRUIT AND VEGETABLE COMMITTEE.

May 14, 1912.

Mr. J. Cheal in the Chair, and sixteen members present.

No awards were recommended on this occasion.

Exhibits.

Mr. Humphrey, Victoria Street: Mustard grown on old mat.
Mr. MacKinlay, Ampthill: Cabbage 'MacKinlay's Matchless.'
Miss Wells, Petersfield: Asparagus.

Fruit and Vegetable Committee, June 4, 1912.

Mr. G. Bunyard, V.M.H., in the Chair, and thirteen members present.

No awards were recommended on this occasion.

Exhibits.

Messrs. Laxton, Bedford: Strawberries.

Fruit and Vegetable Committee, June 18, 1912.

Mr. Geo. Bunyard, V.M.H., in the Chair, and sixteen members present.

Awards Recommended :—

Silver Banksian Medal.

To Mr. A. E. Course, Biggleswade, for Asparagus.

Cultural Commendation.

To Mr. A. E. Course, Biggleswade, for Asparagus.
To Messrs. Whitelegg & Page, Chislehurst, for Newberries.

Other Exhibit.

F. W. Manson, Esq., 26 New Broad Street, E.C.: seedling Orange tree one year old, bearing fruit.

Fruit and Vegetable Committee, July 2, 1912.

At Holland Park.

Mr. Geo. Bunyard, V.M.H., in the Chair, and nineteen members present.

[For awards of cups and medals made by the Council after consultation with the Judges, see p. cxi.]

No awards were recommended on this occasion.

FIG. 96.—LEPTOSPERMUM SCOPARIUM NICHOLLII. (*Garden.*)
(p. cxxxiv.)

[*To face p.* cxxvi.

FIG. 97.—CALCEOLARIA VEITCHII. (*R. Veitch.*) [p. cxxxiv.]

Fig. 98.—Deutzia Veitchii. (*Veitch.*) (p. cxxxiv.)

FIG. 99.—IRIS SQUALENS 'NIBELUNGEN' (*Gard. Chron.*)

Exhibits.

Mrs. Gilliat, Rickmansworth: Figs.

Mr. E. Holder, Bath: Gooseberry 'Holder's First Early.'

Messrs. Laxton, Bedford: Strawberries.

H. P. Sturgis, Esq., Leatherhead: Strawberry 'Peters' Olympia.' **A.M.** July 4, 1911.

FRUIT AND VEGETABLE COMMITTEE, JULY 16, 1912.

Mr. G. BUNYARD, V.M.H., in the Chair, and thirteen members present.

Awards Recommended:—

Gold Medal.

To Lord Llangattock (gr. Mr. Coomber, V.M.H.), The Hendre, Monmouth, for 'Queen' Pineapples.

To Messrs. Veitch, Chelsea, for Gooseberries.

Silver Banksian Medal.

To Messrs. J. K. King, Coggeshall, for Peas and Lettuce.

Award of Merit.

To Peach 'Royal Charlotte' (votes, unanimous), from Sir Trevor Lawrence, Bart. (gr. Mr. Bain), Burford, Dorking. A fine old variety that has been grown in the same house for forty-two years at Burford, never failing to bear a good crop. In the Society's Gardens at Chiswick it also used to do well. Fruit large, roundish ovate, resembling 'Noblesse' in form; skin pale on the shaded side, suture distinct, flesh white tinged with red near the stone, melting, very juicy, and rich in flavour, parting freely from the stone. Flowers small and leaves without glands. Although this is such an old Peach and of such excellent habit and quality it is almost unknown, and it may be hoped that the Fruit Committee's recognition of its merits will be the means of making it more popular.

Cultural Commendation.

To Sir Trevor Lawrence, Bart. (gr. Mr. Bain), Burford, Dorking, for Peach 'Royal Charlotte.'

To C. Moore Kennedy, Esq. (gr. Mr. Hills), Keston, Kent, for Shallots.

Other Exhibits.

Mr. E. C. Arnold, Plymouth: 'All the Year Round' White Shallot.

Mr. G. Brown, Thorngumbald: Raspberries.

Mr. F. H. Chapman, Rye: Marrows.

Mr. H. Dunkin, Warwick: Burbank's 'Santa Rosa' Plum. The experience of the Committee corroborated that of Mr. Dunkin, who found that this plum requires to be grown either in a house or on a

warm wall. They considered that the fruit was of no commercial value.*

Mr. R. Nicholls, Dunstable: 'Nick-all' Berries. This is alleged to be a cross between a Gooseberry and a Black Currant. It produces dark-coloured smooth fruits of intermediate size, borne two or three in a bunch on slender stalks, after the manner of the Currant. The Committee considered the fruit was of no commercial value. (See JOURNAL R.H.S. xxxviii. p. xl.)

Messrs. Spooner, Hounslow: Apples.

Mr. E. P. Sugden, Wimborne: Peas.

C. E. Baring Young, Esq., East Barnet: Red Currants.

FRUIT AND VEGETABLE COMMITTEE, JULY 23, 1912.

SUB-COMMITTEE AT WISLEY.

Mr. J. JAQUES in the Chair, and two members present.

The following varieties of Potatos from the trial were recommended for the inspection of the full Committee at their next meeting.

No 10. }
No. 11. } Sir John Llewelyn, **A.M.** September 11, 1900.
No. 14. Ashleaf Kidney.
No. 16. Irish Gem.
No. 34. King George V.
No. 61. Imperial Beauty.
No. 73. Witchhill Seedling.

FRUIT AND VEGETABLE COMMITTEE, JULY 30, 1912.

Mr. OWEN THOMAS, V.M.H., in the Chair, and nine members present.

Awards Recommended:—

Silver Knightian Medal.

To the Church Army City Gardens, Westminster, for vegetables.

First-class Certificate.

To Potato 'Witchhill Seedling,' from Messrs. Smith, Aberdeen.

Award of Merit.

To Potato 'Imperial Beauty,' from Messrs. Barr, Taplow.

To Potato 'Irish Gem,' from Mr. W. E. Sands, Hillsborough, Co. Down.

To Potato 'King George V,' from Mr. W. E. Sands, Hillsborough, Co. Down.

The above four varieties of Potatos were grown in the trial at Wisley. For descriptions see report on Potatos at Wisley, 1912.

* In appearance the fruit resembled the 'Orleans' Plum, but the flesh and juice was a very dark red, clinging to the stone, and of only second-rate flavour.

Other Exhibits.

Mr. A. R. Allan, Uxbridge: new Melon.
Mr. M. Jones, Welwyn: Peas.
R. Roberts, Esq., Chadwell Heath: Apple 'Padnall Seedling.'
Mr. W. Strugnell, Trowbridge: Melon 'Western Hero.'
Mr. A. Tidy, Cobham: new Melon.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 6, 1912.

SUB-COMMITTEE AT WISLEY.

Mr. JAMES HUDSON, V.M.H., in the Chair, and five members present.

The following produce from the trials was recommended for the inspection of the full Committee at their next meeting:—

Vegetable Marrows.—No. 1, Bush Green; No. 20, Moore's Cream; No. 22, Moore's Cream; No. 33, Sutton's Marrow (**A.M.** Sept 1, 1903); No. 38, White Bush.

Melons.—No. 8, Eminence (**A.M.** June 25, 1907); No. 13, Frogmore Scarlet; No. 17, Hero of Lockinge; No. 31, Sutton's Scarlet (**F.C.C.** August 9, 1907).

FRUIT AND VEGETABLE COMMITTEE, AUGUST 13, 1912.

Mr. JOSEPH CHEAL in the Chair, and eleven members present.

Awards Recommended :—

Silver Banksian Medal.

To Messrs. Spooner, Hounslow, for Apples.

First-class Certificate.

To Melon 'Frogmore Scarlet' (votes, unanimous), from Messrs. J. Veitch, Chelsea (**A.M.** August 24, 1897).

To Melon 'Hero of Lockinge' (votes, unanimous), from Messrs. J. Veitch, Chelsea.

Award of Merit.

To Marrow 'Bush Green' (votes, unanimous), from Messrs. Barr, Covent Garden.

To Marrow 'Moore's Cream' (votes, unanimous), from Messrs. Nutting, London, and Messrs. R. Veitch, Exeter.

To Marrow 'White Bush' (votes, unanimous), from Messrs. Nutting, London.

To Melon 'Royal Favourite' (votes, unanimous), from Messrs. Sutton, Reading.

The above varieties of Marrows and Melons were grown in the Wisley Trials. For descriptions see reports of trials at Wisley. The Committee expressed their appreciation of the excellence of the trial of Melons.

Other Exhibits.

Mr. H. Chandler, Midhurst: natural Raspberry and Blackberry hybrid.

Mr. W. Taylor, Bath: Taylor's Grape Preserver.

FRUIT AND VEGETABLE COMMITTEE, AUGUST 27, 1912.

Mr. G. BUNYARD, V.M.H., in the Chair, and fifteen members present.

Awards Recommended:—

Gold Hogg Medal.

To Messrs. J. Veitch, Chelsea, for fruit trees in pots.

Gold Medal.

To Messrs. Bunyard, Maidstone, for fruit trees in pots and picked fruit.

Silver Knightian Medal.

To Messrs. S. Low, Bush Hill Park, for fruit trees in pots.

Silver Banksian Medal.

To Messrs. Cannell, Swanley, for fruit.

To Hon. Mrs. Merry (gr. Mr. Kelf), Welwyn, for Plums.

Bronze Banksian Medal.

To Rev. L. C. Chalmers Hunt, Hitchin, for Peas and Beans.

First-class Certificate.

To Melon ' John Massey ' (votes, unanimous), from Messrs. Rowlands, Liverpool. For description see Report of Wisley Trial.

Award of Merit.

To Apple ' Padnall Seedling ' (votes, 11 for), from Mr. R. Roberts, Padnall Hall, Chadwell Heath. Fruit large, flattish round; eye set in a shallow basin with closed segments; stalk thin, about 1 inch long, rather deeply inserted in a deep cavity; skin green all over, with a faint blush on the exposed side; flesh crisp, juicy, and acid. A good cooking variety and a prolific bearer. The tree is stated to be a strong grower with large foliage, and the habit pendulous through the tree fruiting at the ends of the branches.

Cultural Commendation.

To Roger Leigh, Esq., for Brown Turkey Figs.

Other Exhibits.

Mr. J. T. Ballard, Benenden: Scarlet Runners.

Mr. F. H. Chapman, Rye: Lemon Cucumbers.

East Anglian Institute of Agriculture, Chelmsford: Plum ' Santa Rosa.'

Mr. J. T. Good, Bushey: seedling Apples.
Mr. Z. Gray, Sandy: Carrots.
W. Mason Greenip, Esq., Fortis Green: Melon 'Lynton Seedling.'
S. Hardy, Esq., Highgate: Potatos.
Mr. G. W. Miller, Wisbech: Apples.
Mr. T. H. Robertson, Coldstream: Shallots.
Mr. H. H. Scott, West Lynn: Apples.
Messrs. R. Veitch, Exeter: Melon 'King George.'

The following resolution was proposed by the Chairman and seconded by Mr. Willard and Mr. Cheal, and carried unanimously, "We, the undersigned members of the R.H.S. Fruit and Vegetable Committee, desire to tender to Mrs. A. Dean and family our sincere condolence and sympathy on their late bereavement, and also to place on record our great appreciation of the many and varied services which Mr. Alexander Dean has rendered to Horticulture during the many years he has worked with us on the Committee." Then followed the names of the Chairman, Vice-Chairmen, and all the Committee present.

FLORAL COMMITTEE.

MAY 14, 1912.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-seven members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Dobbie, Edinburgh, for Sweet Peas.
To Messrs. Mount, Canterbury, for Roses.

Silver Flora Medal.

To Mr. Breadmore, Winchester, for Sweet Peas.
To Messrs. Cutbush, Highgate, for Rhododendrons, Azaleas, and Carnations.
To Messrs. Low, Bush Hill Park, for Carnations and New Holland plants.
To Messrs. May, Upper Edmonton, for flowering plants.
To Mr. C. Turner, Slough, for Lilacs, Japanese Maples, &c.

Silver Banksian Medal.

To Mr. Burnett, Guernsey, for Carnations.
To Messrs. G. Paul, Cheshunt, for Lilacs.

Bronze Flora Medal.

To Mr. Day, Sutton Scotney, for Spanish Iris.
To St. George's Nursery Co., Harlington, for Calceolarias.
To Messrs. Wallace, Colchester, for Irises.

Bronze Banksian Medal.

To Messrs. Allwood, Hayward's Heath, for Carnations.
To Messrs. F. Cant, Colchester, for Roses.
To Mr. P. Ladds, Swanley, for Pelargoniums.
To Messrs. Carter Page, Winchmore Hill, for annuals and Dahlias.
To Mr. A. Perry, Enfield, for Irises and Poppies.
To Mr. M. Prichard, Christchurch, for hardy plants.
To Messrs. Reamsbottom, Geashill, for Anemones.
To Messrs. Young, Cheltenham, for Carnations.

Award of Merit.

To *Cereus amecamensis* (votes, unanimous), from Mr. A. Worsley, Isleworth. The flowers of this handsome plant are of large size, measuring 6 inches across. They are pure white in colour, with a slight shading of green at the base of the petals, and have white

anthers. The erect growing branches of the plant are sharply angled and are several feet in length. (Fig. 128.)

To *Petunia* 'Brown's Purple Strain' (votes, 17 for, 2 against), from Messrs. Brown, Peterborough. A splendid strain of this popular flower having large single flowers of slightly varying shades of deep violet-purple.

To *Phyllocactus Coopermannii* (votes, unanimous), from Mr. A. Worsley, Isleworth. This beautiful plant is the result of crossing *P. Ackermannii major* and *P. Cooperi.* The flowers measure 8 inches across and are of a brilliant orange-vermilion colour, having exceptionally broad petals. (See *Report of Conference on Genetics*, p. 407.)

To *Tropaeolum albiflorum* (votes, 10 for, 4 against), from Miss Willmott, V.M.H. (gr. Mr. C. R. Fielder, V.M.H.), Warley Place, Essex. A rare greenhouse climber from Chile or Peru. The open funnel-shaped flowers are whitish, lined and dotted inside with purple and gold. The small glaucous leaves are digitate and have from three to five segments. The slender climbing stems are reddish purple.

Other Exhibits.

A. C. Bartholomew, Esq., Reading: *Anacyclus formosus.*

Mr. G. A. Box, Lindfield: Anemones.

Burton Hardy Plant Nurseries, Christchurch: hardy plants.

Mrs. Charrington (gr. Mr. Hawthorn), Byfleet: Gloxinias and Caladiums.

Messrs. Cheal, Crawley: hardy plants.

Messrs. Clark, Dover: hardy plants.

Messrs. Clibrans, Altrincham: Rhododendron 'Stanley Davies.'

M. K. Crofton, Esq., Chester: Aubrietia 'Isabel Crofton.'

Mrs. Cutler, Tulse Hill: Lilies of the Valley.

Mrs. Emmans, Regency Street: Aspidistra.

Mrs. Godwin-Austin, Godalming: miscellaneous plants.

Mr. L. Greening, Richmond Hill: rock and water garden.

Sir W. Greenwell (gr. Mr. Lintott), Marden Park: Dracaenas.

Misses Hopkins, Shepperton: hardy plants.

Mr. G. W. Miller, Wisbech: hardy plants.

Messrs. Peed, Mitcham: rock work.

Messrs. Phillips and Taylor, Bracknell: hardy plants.

Mr. G Reuthe, Keston: hardy plants.

Royal Botanic Gardens, Glasnevin: *Solandra Hartwegii.*

Mr. L. R. Russell, Richmond: Pyrethrums.

Mr. V. Slade, Taunton: Pelargoniums.

Mr. T. E. Smiles, Dartford: Pelargoniums.

Messrs. Thompson and Charman, Bushey: rock work.

E. H. Thurston, Esq., Romsey: Pelargonium 'Mrs. Edward Thurston.'

ROYAL INTERNATIONAL HORTICULTURAL EXHIBITION, 1912.

FLORAL COMMITTEE, MAY 22.

Mr. H. B. MAY, V.M.H., in the Chair, and nine members present.

Awards Recommended :—

First-class Certificate.

To *Leptospermum scoparium Nichollii* (votes, unanimous), from Rev. A. T. Boscawen, Long Rock, Cornwall. An erect greenhouse shrub of great beauty, from New Zealand. The flowers are of a bright carmine-crimson, and are borne in great profusion on thin twiggy purplish shoots. The petals are rounded, and in the centre of the flower is a darker ring of colour partly covered by the numerous stamens. The leaves are small, sessile, and linear-lanceolate. (Fig. 96.)

Award of Merit.

To Begonia ' Princess Victoria Louise ' (votes, unanimous), from Messrs. Blackmore & Langdon, Bath. A very beautiful double pale salmon-pink variety of large size. The flowers measure 6 inches across and the petals are very full. A striking feature is the great depth of the flower. The plant is free-flowering and vigorous in growth.

To *Calceolaria* × *Veitchii* (votes, unanimous), from Messrs. R. Veitch, Exeter. A remarkable greenhouse perennial, obtained as the result of a cross between *Calceolaria alba* and an unnamed albino seedling from C. ' Golden Glory.' It has a strong bushy habit of growth and shiny serrated lanceolate leaves. The flowers, which are borne in great abundance, are milk-white in colour. The plants grow to the height of 3 feet during the first season, but when grown on they reach to 4 or 5 feet in height. (Fig. 97.)

To *Celmisia spectabilis argentea* (votes, unanimous), from Messrs. Bees, Liverpool. A new plant, introduced from New Zealand. The flower scapes, which are covered with tomentum, are about 15 inches high, and each carries an aster-like flower 3 inches in diameter, having the ray florets pure white, and the disc florets yellow. The lanceolate leaves are about 8 inches long, and are covered on the upper surface with silky tomentum, and on the under side with thick white felt.

To *Deutzia Veitchii* (votes, unanimous), from Messrs. J. Veitch, Chelsea. A new and perfectly hardy Chinese shrub, with finely serrated lanceolate leaves. The flowers, which are borne in corymbs, are of a beautiful rose-pink and measure 1 inch across when fully open. The bright yellow anthers are borne on petaloid filaments. The plant is said to force well. (Fig. 98.)

To *Eremurus* × *Tubergenii* (votes, unanimous), from Messrs. R. Wallace, Colchester. A very handsome hybrid raised by Mr. Van Tubergen. The pure bright yellow flowers with orange anthers are borne in dense bold spikes 18 inches long, which are supported on stout stems of good height.

Fig. 100.—Lilium davuricum luteum. (*Gard. Chron.*) (p. cxxxv.)

[*To face p.* cxxxiv

Fig. 102.—Oxalis enneaphylla rosea. (*Elliott.*) (p. cxxxv.)

Fig. 103.—Pyrethrum 'Queen Mary.' (*Gard. Mag.*) (p. cxxxvi.)

[*To face p. cxx*

To *Hydrangea Sargentii* (votes, unanimous), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree, and Messrs. J. Veitch, Chelsea. A new species collected in Western China by Mr. E. H. Wilson, V.M.H. The inflorescence consists of numerous pale lilac fertile flowers and from eight to ten pure white sterile flowers which measure 1½ inch across and stand well out from the corymb. The leaves are large, dark green above and paler beneath, and are covered on both surfaces with hairs. The stems are also covered with hairs. The plants exhibited were about 4 feet in height.

To *Iris squalens* 'Nibelungen' (votes, unanimous), from Messrs. Barr, Taplow. A large, handsome variety, growing about 20 inches high, and having the standards fawn-yellow and the falls violet-purple with a fawn margin. (Fig. 99.)

To *Iris variegata* 'Ossian' (votes, 6 for), from Messrs. Barr, Taplow. A large and beautiful Iris, growing about 2½ feet high, and having the standards canary-yellow and the falls light claret-red veined with yellow and purple.

To *Lastrea patens Mayi* (votes, unanimous), from Messrs. H. B. May, Upper Edmonton. A very highly decorative fern, having very plumose and finely dissected light-green fronds of great beauty. (Fig. 110.)

To *Leptospermum scoparium Boscawenii* (votes, unanimous), from Rev. A. T. Boscawen, Long Rock, Cornwall. A most graceful, free-flowering greenhouse shrub from New Zealand, similar in habit to the variety described above, but having white sessile flowers, deeply tinged with bright rose. The rosy buds are exceptionally pretty and the linear-lanceolate sessile leaves are about ¾ inch long. The individual flowers measure 1 inch across.

To *Lilium davuricum luteum* (votes, 8 for), from Mr. A. Perry, Enfield. The flowers of this charming Japanese lily are rich yellow, prettily mottled with reddish-brown in the interior. The plant grows from 2½ to 3 feet in height. (Fig. 100.)

To *Lilium myriophyllum* (votes, unanimous), from Messrs. R. Wallace, Colchester. A beautiful hardy lily introduced from China. Its flowers are like those of *L. Brownii* in shape. The segments of the perianth are creamy-white flushed with pink, and the interior of the throat is yellow. The anthers are bright orange in colour, and the leaves are narrow and about 4 inches long. (Fig. 101.)

To *Oxalis enneaphylla rosea* (votes, 3 for, 1 against), from Mr. C. Elliott, Stevenage. This charming dwarf rock plant was collected by the exhibitor in the Falkland Islands, and has large rose-coloured flowers measuring from 1 to 1½ inches across. The foliage is similar to that of the type. (Fig. 102.)

To *Polypodium glaucum Hillii*, from Messrs. Hill, Lower Edmonton. A very pretty sport from *P. glaucum*, producing spores from which it can be raised easily.

To *Polypodium Vidgenii* (votes, unanimous), from Messrs. May, Upper Edmonton. A lovely epiphytic species from Queensland,

Australia. The long, gracefully arching fronds of a light green have finely divided pinnæ, and from the base of the plant rise numerous shorter brownish-red sterile fronds. (Fig. 104.)

To *Populus alba Richardii*, from Monsieur A. G. M. Richard, Naarden-Bussum, Amsterdam. A pretty golden variety of the 'White Poplar.'

To *Pyrethrum* 'Queen Mary' (votes, unanimous), from Mr. G. W.

Fig. 104.—Polypodium Vidgenii. (*May.*)

Miller, Wisbech. A large, delicate, rosy-pink variety, which flowers early, and is a valuable plant for producing cut blooms. It is a favourite market variety. (Fig. 103.)

To Rose 'Maman Turbat,' from Messrs. E. Turbat, Orleans, France. A variety somewhat resembling 'Baby Tausendschön,' but with rather larger trusses of bloom.

To Rose 'M. Jules Gauchalt,' from Messrs. E. Turbat. A dwarf polyantha rose of the 'Tausendschön' type, with large clusters of deep-pink flowers, which fade to a purplish hue.

To Rose 'Yvonne Rabier,' from Messrs. E. Turbat. An excellent dwarf polyantha variety, having white flowers borne very freely in large trusses.

To Sweet Pea 'Brunette' (votes, unanimous), from Messrs. Dobbie, Edinburgh. A variety having deep mahogany-red flowers of large size and perfect form.

To Sweet Pea 'Melba' (votes, unanimous), from Messrs. Dobbie. A lovely large salmon self slightly paler than 'Earl Spencer.' The flower has an exceptionally broad standard, and many of the spikes carry four blooms each. (Fig. 3.)

To Sweet Pea 'Mrs. Cuthbertson' (votes, unanimous), from Messrs. Dobbie. A charming bicolour variety, having the standard clear rose-pink and the white wings slightly suffused with pale rose.

To *Papaver orientale* 'Edna Perry' (votes, 5 for, 1 against), from Mr. A. Perry, Enfield. A very pretty and distinct variety, having deeply fringed rosy-salmon petals, blotched with dark crimson.

To *Papaver orientale* 'Perry's White' (votes, unanimous), from Mr. A. Perry. A distinct novelty, having large whitish flowers, with a purplish-crimson bar on each petal.

Other Exhibits.

Messrs. Bakers, Codsall: *Spiraea* 'Codsall Queen,' Rose 'Dorothy Jeavons.'

Mr. J. Bastock, Birmingham: Viola 'Moseley Beauty.'

Mr. F. Bell, Whiteley Bay: Viola 'Evelyn Bell.'

Messrs. Brown, Peterborough: hardy plants.

Mr. A. J. A. Bruce, Manchester: Sarracenias.

Sir J. Colman, Bart., V.M.H., Reigate: Fern.

Messrs. Dicksons, Chester: Primula 'Lady Robertson.'

W. S. Edwardson, Esq., Sidcup: Begonias.

H. J. Elwes, Esq., V.M.H., Cheltenham: *Oxalis adenophylla*, *Deinanthe coerulea*, *Agave protuberans.*

Mr. A. Fabius, Emsworth: *Asparagus Hatcheri.*

Messrs. Fisher, Son, & Sibray, Sheffield: shrubs, Crotons, &c.

Messrs. Godfrey, Exmouth: Pelargoniums.

Messrs. Hobbies, Dereham: Roses.

Messrs. Jackman, Woking: Clematis.

Messrs. Koster, Boskoop: Lilac 'Hugo Koster.'

Messrs. S. Low, Bush Hill Park: Carnations.

Mr. Notcutt, Woodbridge: *Taxodium distichum pendulum.*

Mr. W. H. Page, Hampton: Pelargoniums.

Messrs. G. Paul, Cheshunt: Roses, &c.

Messrs. W. Paul, Waltham Cross: Roses.

Messrs. Richon & Hermis, Paramé: Carnation 'Arlette.'

Messrs. Stredwick, St. Leonards-on-Sea: Dahlia 'Goldfinch.'

Messrs. Ware, Feltham: Begonias and *Silene Hookeri.*
Messrs. Watkins & Simpson, Covent Garden: annuals.
Messrs. Whitelegg & Page, Chislehurst: *Impatiens Miltoniana.*

FLORAL COMMITTEE, JUNE 4, 1912.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-six members present.

Awards Recommended:—

Farrer Cup for Rock Plants.

To Messrs. Bees, Liverpool, whose exhibit included *Dracocephalum bullatum, Weldenia candida, Primula yunnanensis, P. pulchella,* and *P. membranifolia.*

Gold Medal.

To Messrs. Dobbie, Edinburgh, for Sweet Peas.

Silver-gilt Flora Medal.

To Mr. H. Burnett, Guernsey, for Carnations.
To Messrs. Kelway, Langport, for Delphiniums, Paeonies, &c.
To Messrs. G. Paul, Cheshunt, for Roses and Paeonies.

Silver Flora Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To G. Ferguson, Esq. (gr. Mr. F. W. Smith), Weybridge, for Delphiniums.
To Messrs. Peed, Streatham, for Gloxinias, &c.
To Mr. A. Perry, Enfield, for Poppies, &c.
To Vivian Phillipps, Esq., Orpington, for Calceolarias.
To Mr. G. Prince, Longworth, for Roses.
To Messrs. J. Veitch, Chelsea, for greenhouse plants, &c.
To Messrs. Ware, Feltham, for hardy plants.

Silver Banksian Medal.

To Mr. C. Blick, Hayes, for Carnations.
To Mr. J. Box, Lindfield, for hardy plants.
To Messrs. F. Cant, Colchester, for Roses.
To M. A. Delmard, Sophia, for pictures of Bulgarian gardens, &c.
To Mr. E. J. Hicks, Twyford, for Roses.
To Messrs. E. W. King, Coggeshall, for Sweet Peas.
To Mrs. Lloyd Edwards, Llangollen, for hardy plants.
To Messrs. May, Upper Edmonton, for flowering plants.

Bronze Flora Medal.

To Messrs. Whitelegg and Page, Chislehurst, for hardy plants.

Bronze Banksian Medal.

To Messrs. Bakers, Codsall, for hardy plants.

First-class Certificate.

To *Elaeocarpus cyaneus* (*reticulatus*) (votes, unanimous), from Messrs. J. Veitch, Chelsea. A delightful cool-greenhouse evergreen shrub from Australia bearing very freely in axillary racemes drooping white Soldanella-like flowers with beautifully fringed petals. The dark green leaves are oblong-lanceolate in shape, serrated and netted with veins, and the wood of the shrub is of a dull purplish colour. (Fig. 105.)

Award of Merit.

To Carnation 'Attraction' (votes, unanimous), from Mr. C. Blick, Hayes. A beautiful pure white border variety of good shape and size. It is slightly scented.

To Carnation 'Margaret Lennox' (votes, unanimous), from Mr. J. Douglas, Great Bookham. Another border variety of great excellence with a pure yellow ground and having a deep rosy-crimson edging to the petals. The flowers are of perfect form and of good size.

To Carnation 'Queen Mary' (votes, 10 for), from Mr. C. Blick, Hayes. A magnificent deep salmon rose border variety of remarkable size and of beautiful form. It is a vigorous grower and is one of the most fragrant Carnations in existence at the present time. (Fig. 106.)

To Delphinium 'Dusky Monarch' (votes, 13 for, 5 against), from Messrs. Kelway, Langport. A very robust variety having large tall spikes of deep violet purple flowers, which each measure 2½ inches across.

To Gladiolus 'Rosina' (votes, 13 for, 2 against), from Mr. C. B. Blampied, St. Martins, Guernsey. A very pretty graceful variety raised by crossing an unnamed hybrid with Gladiolus 'General Scot.' The flowers are pale pink with crimson and cream blotches on the lower petals. It is said to be of medium height and should prove most useful for market work.

To Pelargonium 'Champion' (votes, 14 for), from Mr. P. Ladds, Swanley. This splendid 'Zonal' is a seedling from the well-known 'Paul Crampel.' It bears tremendous trusses of deep rosy-pink flowers with a white centre. It is a free bloomer and a vigorous grower.

To *Silene Hookeri* (votes, 17 for), from Messrs. T. S. Ware, Feltham, Middlesex. A pretty decumbent perennial from California. The flowers measure about 2 inches across and are pale rosy-pink in colour. Two parallel white ridges run along the middle of the claw and terminate in white teeth at the blade. The leaves are hairy, narrow and from 2 to 3 inches long. (Fig. 107.)

To Sweet Pea 'Dobbie's Lavender George Herbert' (votes, 18 for), from Messrs. Dobbie, Edinburgh. The flowers of this charming variety are bluish lavender in colour and of good size. They are borne mostly in fours. The stock of this Sweet Pea has now been fixed, and can be relied upon to come true to type.

To Sweet Pea 'Dobbie's Thomas Stevenson' (votes, unanimous),

from Messrs. Dobbie, Edinburgh. A lovely bright orange scarlet variety of beautiful form and large size. (Fig. 4.)

To Sweet Pea 'May Campbell' (votes, unanimous), from Messrs. Dobbie, Edinburgh. The ground colour of this variety is cream. The standard is marbled in the centre with carmine and the wings are slightly veined with the same colour.

To *Wahlenbergia vincaeflora* (shown as *W. gentianoides*) (votes, 11 for), from Messrs. Piper, Bayswater. The flowers of this plant resemble very closely those of a Campanula, and are pale blue in colour, shading to almost white inside. They are borne on very slender stems about 18 inches high. The leaves are narrow with crinkled margins. (Fig. 108.)

Cultural Commendation.

To J. T. Bennett-Poë, Esq. (gr. Mr. Downes), Cheshunt, for *Utricularia montana.*

Other Exhibits.

Messrs. Aldersey and Marsden Jones, Malpas: Sweet Peas, &c.
Messrs. Barr, Taplow: Watsonias.
Messrs. Bath, Wisbech: hardy plants.
Messrs. Bide, Farnham: Sweet Peas.
Messrs. Bunyard, Maidstone: hardy plants.
Messrs. Cannell, Swanley: Pelargoniums, &c.
Messrs. Cutbush, Highgate: Hydrangeas, Crotons, &c.
Messrs. Dicksons, Chester: Primula 'Lady Robertson.'
Messrs. Fells, Hitchin: hardy plants.
W. H. B. Fletcher, Esq., Bognor: hybrid Foxglove.
Mr. L. Greening, Richmond Hill: rock and water garden.
Misses Hopkins, Shepperton: hardy plants.
Mr. J. Hudson, V.M.H., Acton: *Phyllocactus* vars.
Messrs. Low, Bush Hill Park: Malmaison Carnations.
C. J. Lucas, Esq., Horsham: *Rosa laevigata majus.*
Messrs. Carter Page, Winchmore Hill: annuals, Dahlias, and Violas.
Messrs. Phillips and Taylor, Bracknell: hardy plants.
Messrs. Reamsbottom, Geashill: Anemones.
Mr. G. Reuthe, Keston: hardy plants.
Mr. L. R. Russell, Richmond: hardy plants.
Mr. T. E. Smiles, Dartford: *Pelargonium* 'Othello.'
Miss Willmott, V.M.H., Warley: *Verbascum.*
Hon. Frances Wolseley, Glynde: miniature Italian garden.

Floral Committee, June 14, 1912.

Sub-Committee at Wisley.

Mr. H. B. May, V.M.H., in the Chair, and six members present.

The following varieties of Delphiniums were selected for the consideration of the full Committee at their next meeting:—

- 'Colonel Crabbe.'
- 'Cymbeline.'
- 'Darius.'
- 'Dr. Bergman.'
- 'Dr. Lodwidge.'
- 'Jessica.'
- 'J. S. Sargent.'
- 'Lizzie van Veen.'
- 'Lorenzo.'
- 'Madame E. Geny.'
- 'Mr. J. S. Brunton.'
- 'Mrs. James Kelway.'
- 'Royal Standard.'
- 'Smoke of War.'

Floral Committee, June 18, 1912.

Mr. H. B. May, V.M.H., in the Chair, and twenty-three members present.

Awards Recommended :—

Gold Medal.

To Messrs. Sutton, Reading, for Sweet Peas.

Silver-gilt Flora Medal.

To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. F. Cant, Colchester, for Roses.
To Messrs. Veitch, Chelsea, for greenhouse plants, Eremurus, &c.

Silver-gilt Banksian Medal.

To Mr. J. Box, Lindfield, for Sweet Peas and hardy plants.

Silver Flora Medal.

To Messrs. Blackmore & Langdon, Bath, for Delphiniums.
To Mr. H. Burnett, Guernsey, for Carnations.
To Messrs. Clark, Dover, for hardy plants.
To Messrs. Cutbush, Highgate, for hardy plants.
To Messrs. Gunn, Olton, for Phloxes.
To Messrs. Jackman, Woking, for hardy plants.
To Messrs. Carter Page, London Wall, for Violas, Dahlias, &c.
To Messrs. W. Paul, Waltham Cross, for Roses.
To Mr. A. Perry, Enfield, for Delphiniums and Nymphaeas.
To Messrs. Wallace, Colchester, for hardy plants.

Silver Banksian Medal.

To Messrs. Barr, Covent Garden, for hardy plants.
To Messrs. Bath, Wisbech, for Paeonies and Delphiniums.
To Messrs. Bunyard, Maidstone, for hardy plants.
To Messrs. Cannell, Swanley, for Begonias, &c.

To Messrs. Godfrey, Exmouth, for Canterbury Bells.
To Mr. L. Greening, Richmond Hill, for rock and water garden.
To Messrs. Kelway, Langport, for Delphiniums and Paeonies.
To Messrs. S. Low, Enfield, for Roses and Malmaison Carnations.
To Messrs. May, Upper Edmonton, for Ferns and flowering plants.
To Messrs. G. Paul, Cheshunt, for Paeonies and Roses.
To Mr. M. Prichard, Christchurch, for hardy plants.

Bronze Flora Medal.

To Messrs. Bakers, Codsall, for hardy plants.
To Mr. L. R. Russell, Richmond, for Salvias, &c.
To Messrs. T. S. Ware, Feltham, for hardy plants.

Bronze Banksian Medal.

To Messrs. Brown, Peterborough, for hardy plants.
To Misses Hopkins, Shepperton, for hardy plants.
To Messrs. E. W. King, Coggeshall, for Sweet Peas.
To Mr. G. Reuthe, Keston, for hardy plants.
To Messrs. Walters, Bath, for hardy plants.

Award of Merit.

To Begonia 'F. W. Walker' (votes, unanimous), from Messrs. Blackmore & Langdon, Bath. A magnificent bright scarlet variety measuring 5 inches across. The flowers are fully double and of perfect shape. They are of great depth and are produced very freely.

To Begonia 'James Braid' (votes, unanimous), from Messrs Blackmore & Langdon. Another handsome variety resembling the above in size and form. It is of a deep crimson-scarlet colour.

To Begonia 'Golden Shower' (votes, unanimous), from Messrs. Blackmore & Langdon. A charming drooping variety for growing in hanging baskets. It is very free in growth and flowering. The flowers are a rich apricot, and the half-opened buds are particularly pretty. (Fig. 115.)

To Carnation 'Charles Blick' (votes, 10 for, 4 against), from Mr. C. Blick, Hayes. A pure white seedling 'Malmaison' of perfect form, and measuring 4½ inches across. It is sweetly fragrant, a good grower and is undoubtedly the finest white 'Malmaison' yet raised.

To Carnation 'Cyclops' (votes, 10 for, 3 against), from Mr. C. Blick, Hayes. A very distinct border variety of large size and good shape. The ground colour is orange suffused with bright crimson. It is not scented.

To Carnation 'Mrs. Huson Morris' (votes, 8 for, 4 against), from Sydney Morris, Esq. (gr. Mr. Henley), Wretham Hall, Thetford. A good salmon-pink perpetual flowering variety. It is the result of a cross between the varieties 'Mrs. H. Burnett' and 'Mrs. T. W. Lawson.' The flowers are large and are borne on stiff stems. The calyx rarely splits and the plant is a good grower.

To Delphinium 'Colonel Crabbe' (votes, unanimous), from Messrs. J. Forbes, Hawick. For description see p. 263.

FIG. 105.—ELAEOCARPUS CYANEUS (RETICULATUS). (*Gard. Mag.*) (p. cxxxix.)

To face p. clii.

FIG. 106.—CARNATION 'QUEEN MARY.' (*Blick.*) (p. cxxxix.)

FIG. 107.—SILENE HOOKERI. (*Gard. Chron.*) (p. cxxxix.)

FIG. 108.—WAHLENBERGIA VINCAEFLORA. (*Piper.*) (p. cxl.)

[*To face p.* cxliii.

To Delphinium 'Cymbeline' (votes, unanimous), from Messrs. Bunyard, Maidstone. For description see p. 263.

To Delphinium 'Darius' (votes, unanimous), from Messrs. Bunyard, Maidstone. For description see p. 263.

To Delphinium 'Drake' (votes, 11 for), from Messrs. Kelway, Langport. A pale cobalt-blue variety of large size with a white centre. The flowers are borne on a good bold spike.

To Delphinium 'Dr. Bergman' (votes, unanimous), from Messrs. J. Forbes, Hawick. For description see p. 264.

To Delphinium 'Dr. Lodwidge' (votes, unanimous), from Messrs. Kelway, Langport. For description see p. 264.

To Delphinium 'Harry Smetham' (votes, 13 for), from Messrs. Blackmore & Langdon, Bath. A rich porcelain-blue variety, with rosy-mauve shading. The flowers are semi-double, symmetrical, and borne on a good tapering spike.

To Delphinium 'Jessica' (votes, unanimous), from Messrs. Bunyard, Maidstone. For description see p. 265.

To Delphinium 'J. S. Sargent' (votes, unanimous), from Messrs. Forbes, Hawick. For description see p. 265.

To Delphinium 'Lavanda' (votes, 12 for, 4 against), from G. Ferguson, Esq. (gr. Mr. F. W. Smith), The Hollies, Weybridge. A striking novelty, having flowers of a charming shade of bright violet-purple. The individual flowers measure about 2½ inches across and have a small white centre. The spike is good and well furnished.

To Delphinium 'Lizzie van Veen' (votes, unanimous), from Mr. J. Box, Lindfield. For description see p. 266.

To Delphinium 'Lorenzo' (votes, unanimous), from Messrs. Bunyard, Maidstone. For description see p. 266.

To Delphinium 'Lovely' (votes, 13 for), from Messrs. Kelway, Langport. A beautiful semi-double variety, having the outer petals light cornflower blue, and the inner ones heavily tinged with violet-purple. The centre is white and the spike bold.

To Delphinium 'Madame E. Geny' (votes, unanimous), from Messrs. J. Forbes, Hawick. For description see p. 267.

To Delphinium 'Mr. J. S. Brunton' (votes, unanimous), from Mr. B. Ruys, Dedemsvaart, Holland. For description see p. 267.

To Delphinium 'Mrs. James Kelway' (votes, unanimous), from Messrs. Kelway, Langport. For description see p. 267.

To Delphinium 'Royal Standard' (votes, unanimous), from Messrs. J. Forbes, Hawick. For description see p. 269.

To Delphinium 'Smoke of War' (votes, unanimous), from Messrs. Kelway, Langport. For description see p. 270.

To Delphinium 'Tagalie' (votes, 12 for), from Messrs. Kelway, Langport. The flowers of this charming variety are of deepest Royal blue slightly tinged with violet-purple. The centre is small and white, and the large flowers stand well out from the stem forming a very bold and effective spike.

To Eremurus 'Lemon Queen' (votes, 9 for, 1 against), from

Messrs. J. Veitch, Chelsea. A good hardy plant bearing on a very tall rigid stem a spike of rich yellow flowers with prominent orange anthers.

To *Lavatera Olbia* (votes, 14 for, 3 against), from Mr. M. Prichard, Christchurch. This charming and graceful plant is a native of

FIG. 109.—LAVATERA OLBIA. (*M. Prichard.*)

Provence. The flowers possess five obcordate rose petals. Each flower measures about 4 inches across, and the plant is very free blooming, and has a shrubby, scabrous stem. The leaves are soft and woolly. (Fig. 109.)

To Philadelphus ' Bouquet Blanc ' (votes, unanimous), from Messrs. J. Veitch, Chelsea. A useful shrub bearing small, pure white, semi-double, fragrant flowers in closely packed clusters. The leaves are very small. (Fig. 116.)

To Philadelphus ' Voie lactée ' (votes, unanimous), from Messrs. G. Paul, Cheshunt, and Messrs. J. Veitch, Chelsea. The flowers of this variety are very large and pure white. They are freely borne and are sweetly fragrant. The serrated leaves are pale green and measure 5 inches long by 3 inches broad at the widest part. (Fig. 117.)

To Rose ' Effective ' (votes, unanimous), from Messrs. Hobbies, Dereham. A new seedling pillar rose obtained as the result of a cross between ' General McArthur ' and ' Carmine Pillar.' The flowers are rich crimson and measure 3½ inches across. They are very sweetly scented and are borne very freely on good stalks. The foliage is bold and distinct.

To Rose ' Pink Pearl ' (votes, unanimous), from Messrs. Hobbies, Dereham. This very distinct new climbing variety is the result of a cross between ' Una ' and ' Irish Elegance.' It has the form and shape of the latter, and is pale rose-pink, with apricot shading at the base of the petals. The blooms measure 3 inches across, and the petals which do not drop quickly are of splendid substance.

Other Exhibits.

Miss Agar, Amersham Common: Rose ' Bright Fortune.'

Mr. A. J. Baker, Thornton Heath: Delphinium ' Mrs. A. Baker.'

Messrs. Bull, Chelsea: Spanish Irises.

Messrs. Cheal, Crawley: rockery.

Messrs. Grove, Sutton Coldfield: hybrid Dianthus and Chrysanthemum ' Marion.'

C. E. Gunther, Esq., Hawkhurst: *Aristolochia elegans.*

A. Kingsmill, Esq., Harrow Weald: *Acer colchicum.*

Mr. P. Ladds, Swanley: greenhouse plants.

Mr. A. Langley Smith, Catford: hybrid Pelargoniums.

Mr. F. Lilley, Guernsey: Irises and Gladioli.

Mrs. Martineau, Twyford: *Salvia Sclarea.*

Mr. F. E. Newman, Watford: Pink ' Challenger.'

Mr. R. Prichard, West Moors: hardy plants.

Mr. H. C. Pulham, Stansted: hardy plants

Mr. V. Slade, Taunton: Pelargoniums and Ferns.

Messrs. Stark, Great Ryburgh: Sweet Peas.

Messrs. Treseder, Cardiff: Pelargoniums.

Messrs. Wells, Merstham: hardy plants.

FLORAL COMMITTEE, JULY 2, 1912.

AT HOLLAND PARK.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-two members present.

[For awards of cups and medals made by the Council after consultation with the Judges, see p. cxi.]

Awards Recommended :—

First-class Certificate.

To *Lastrea patens Mayi* (votes, unanimous), from Messrs. May, Upper Edmonton. A charming fern intermediate between *L. lepida*

FIG. 110.—LASTREA PATENS MAYI. (*May.*)

and *L. patens*. It has large arching fronds of very plumose habit, and of a beautiful pale green. An award of merit was granted to this plant at the International Show at Chelsea on May 22, 1912. (Fig. 110.)

To *Lilium warleyense* (votes, unanimous), from Miss Willmott, V.M.H. (gr. Mr. C. Fielder, V.M.H.), Warley Place, Great Warley. This beautiful hardy lily was collected in China by Mr. E. H. Wilson, V.M.H., and it has proved to be a strong and good grower. It grows

4 feet high and flowers in the open about the middle of July. The flowers measure 3 inches across and are reddish-orange in colour and numerous small brown spots cover the recurved petals. The stamens are chocolate brown and the leaves are narrow, linear, and about 5 inches long. One of the plants exhibited had a spike bearing twenty flowers and buds. (Fig. 118.)

FIG. 111.—POLYPODIUM MANDAIANUM. (*Manda.*)

To *Polypodium Mandaianum* (votes, unanimous), from Mr. W. A. Manda, St. Albans. A magnificent fern having glaucous green crested fronds from 5 to 6 feet in length and sometimes reaching 30 inches in breadth. The fronds are deeply serrated and gracefully undulating. The plant is said to do well in either a cold or a warm house, and to

stand sunshine without injurious effect. The fronds remain fresh for a long time after being cut. (Fig. 111.)

Award of Merit.

To Astilbe 'Avalanche' (votes, unanimous), from Messrs. van Waveren and Kruyff, Sassenheim, Holland. This is a good creamy white variety obtained as the result of a cross between *Spiraea compacta multiflora* and *Astilbe chinensis*. The flowers are very freely borne on

FIG. 112.—BEGONIA 'FLORENCE NIGHTINGALE.' (*Blackmore and Langdon.*)

reddish stems which darken in colour with age. The plant is of stiff and sturdy habit, and the leaves are dark green and deeply serrated.

To Begonia 'Florence Nightingale' (votes, unanimous), from Messrs. Blackmore and Langdon, Bath. An excellent variety having

Fig. 113.—Begonia 'Mrs. Robert Morton.' (*Blackmore and Langdon.*)

pure white double flowers measuring 6 inches across and of perfect form and good substance. (Fig. 112.)

To Begonia 'Mrs. Robert Morton' (votes, unanimous), from Messrs. Blackmore and Langdon. The flowers of this beautiful variety are fully double and measure 6 inches across. They are deep yellow

with a pretty shading of salmon pink on the reverse of the petals. (Fig. 113.)

To Carnation 'Jean Douglas' (votes, unanimous), from Mr. J. Douglas, Great Bookham. A bright scarlet 'Border' variety of good size and perfect form with a non-splitting calyx.

To Carnation 'John Ridd' (votes, unanimous), from Mr. J.

FIG. 114.—PHLOX ARENDSII. (*Arends.*)

Douglas, Great Bookham. A large fancy 'Border' variety having a ground of clear yellow heavily flaked with deep rose pink. (Fig. 121.)

To Clematis 'Lady Betty Balfour' (votes, unanimous), from Messrs. Jackman, Woking. A beautiful hybrid obtained as the result of a cross between C. 'Gipsy Queen' and C. 'Beauty of Worcester.' The flowers are deep violet purple with a bar of crimson down the middle of each of the six petals. The bold mass of white stamens forms a

FIG. 115.—BEGONIA 'GOLDEN SHOWER.' (*Gard. Mag.*) (p. cxlii.)

[*To face p.* cl

Fig. 116 Philadelphus 'Bouquet Blanc.' (*Gard. Mag.*) ([illegible])

Fig. 117.—Philadelphus 'Voie lactée.' (*Gard. Mag.*) (p. cxlv.)

FIG. 118.—LILIUM WARLEYENSE. (*Gard. Mag.*) (p. cxlvi.)

[*To face p.* cli.

pleasing contrast. The lanceolate foliage resembles that of *C. Jackmanii.* It is a very strong-growing plant and produces its blooms abundantly. (Fig. 122.)

To *Nephrolepis exaltata Rochfordii* (votes, 8 for, 3 against), from Messrs. Rochford, Broxbourne. The pinnæ are so much divided and sub-divided that the fronds assume a dense mossy appearance. They are of a lovely pale-green colour.

To *Phlox Arendsii* (strain) (votes, unanimous), from G. Arends, Ronsdorf, Germany. A remarkable strain of Phloxes obtained as the result of a cross between *P. decussata* and a hybrid from *P. canadensis* and *P. Laphamii.* The flowers vary in colour from white to rose and pale violet and the stems are very stiff and wiry. The plants grow to the height of 2 feet and are strong and free growers and flower much in advance of *P. decussata.* (Fig. 114.)

To Rose 'Ethel' (votes, 10 for, 5 against), from Mr. C. Turner, Slough. A charming *Wichuraiana* hybrid climber with numerous large trusses of semi-double rosy-pink flowers shading to white in the centre.

To Rose 'Mrs. Charles S. Hunting' (votes, unanimous), from Messrs. Hugh Dickson, Belfast. A charming H. T. of good substance and of a cadmium yellow colour. The flowers are of beautiful shape and form, and this variety is no doubt one of the best of the Hybrid Teas.

Botanical Certificate.

To *Deinanthe coerulea* (votes, unanimous), from Miss Willmott, V.M.H. (gr. Mr. C. Fielder, V.M.H.), Warley Place, Great Warley. This is a new Chinese plant introduced by Mr. E. H. Wilson, V.M.H., having large, ovate, serrate leaves and pale violet flowers, resembling those of the Hydrangea somewhat in structure. It is said that the plant is often cut down by the frost early in the year, but it always grows and flowers again in spite of this.

Other Exhibits.

Messrs. Barr, Taplow: hardy plants.
Rev. A. T. Boscawen, Long Rock, Cornwall: Veronicas.
Mr. C. Breadmore, Winchester: Sweet Peas.
Messrs. Carter, Raynes Park: *Araucaria exaltata gracilis.*
Messrs. Clark, Dover: ferns and Pelargoniums.
Mr. Deal, Kelvedon: Sweet Peas.
Messrs. A. Dickson, Newtownards: Roses.
Mr. A. T. Dutton, Iver: Carnations.
Mr. Hemsley, Crawley: Geranium 'Queen Mary.'
Messrs. Hobbies, Dereham: Roses.
Messrs. Ladhams, Southampton: *Salvia superba.*
Mr. Le Cornu, Jersey: Rose 'Duchess of Normandy.'
Mrs. Martineau, Twyford: *Salvia Sclarea.*
Messrs. G. Paul, Cheshunt: Roses.

Messrs. W. Paul, Waltham Cross: Roses.
Mr. R. Prichard, West Moors: *Pentstemon isophyllus*.
The Duke of Rutland, Grantham: Rose 'Lady Diana Manners.'
Messrs. C. Smith, Guernsey: Gladioli.
Messrs. R. Veitch, Exeter: *Calceolaria Veitchii*.
Messrs. Wallace, Colchester: hardy plants.
Messrs. Ware, Feltham: Begonias.
Messrs. Wells, Merstham: Carnation 'Lady Algy.'

FLORAL COMMITTEE, JULY 16, 1912.

Mr. H. B. MAY, V.M.H., in the Chair, and nineteen members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. May, Upper Edmonton, for Ferns and miscellaneous flowering plants.

To Messrs. Veitch, Chelsea, for miscellaneous flowering plants.

Silver Flora Medal.

To Messrs. Cannell, Swanley, for Cacti.
To Messrs. Kelway, Langport, for Gladioli.
To Messrs. Carter Page, Winchmore Hill, for Antirrhinums, Violas, &c.
To Messrs. Peed, Norwood, for Gloxinias and Streptocarpus.

Silver Banksian Medal.

To Mr. C. Blick, Hayes, for Carnations.
To Messrs. Cutbush, Highgate, for Carnations, &c.
To Messrs. Gunn, Olton, for Phloxes.
To Messrs. Jones, Lewisham, for Phloxes.
To King's Acre Nursery, Hereford, for Eremurus.
To Mr. A. Perry, Enfield, for Nymphaeas and herbaceous plants.
To Messrs. Phillips & Taylor, Bracknell, for Nymphaeas and hardy plants.

Bronze Flora Medal.

To Messrs. Low, Enfield, for Roses.
To Mr. M. Prichard, Christchurch, for hardy plants.
To Mr. G. Reuthe, Keston, for hardy plants.
To Messrs. Ware, Feltham, for hardy plants.

First-class Certificate.

To *Nephrolepis exaltata muscosa* (votes, 9 for, 4 against), from Messrs. May, Upper Edmonton. A sport from *N. superbissima*, having very handsome crispate, light-green fronds, with finely divided pinnæ. The plant is very compact in habit. (Fig. 119.)

To *Plagianthus Lyallii* (votes, 13 for), from Messrs. R. Veitch,

Exeter. This plant received an Award of Merit on July 18, 1911. For description and plate see vol. xxxvii., p. cxlv.

Award of Merit.

To *Astilbe* 'Rhenania' (votes, unanimous), from Mr. W. Profittlich, Twickenham. A bright rosy-pink variety, of stiff and vigorous habit, obtained as the result of a cross between 'Queen Alexandra' and *A. Arendsii* 'Ceres.' It is perfectly hardy and very free-flowering.

To *Crossandra undulaefolia* (votes, unanimous), from Sir Trevor Lawrence, Bart. (gr. Mr. Bain), Burford, Dorking. An erect growing stove plant, with flowers of a rich orange-salmon colour. The flowers

FIG. 119.—NEPHROLEPIS EXALTATA MUSCOSA. (*May.*)

measure about $1\frac{3}{4}$ inch across, and have a remarkable flat five-cleft limb to the corolla. The ovate-acuminate leaves are glossy and dark green, and waved at the margin. The plant is about 18 inches high, and produces large numbers of flowers. (Fig. 123.)

To Gladiolus 'Lang-Prim Hybrid Strain' (votes, unanimous), from Messrs. Kelway, Langport. This is quite a new strain of hybrid Gladioli, the majority of which are the result of crossing *Gandavensis* hybrids with *G. primulinus*. They are most graceful in habit, and

exhibit a wonderful range of charming colours, including pure yellow, pale lemon-yellow, apricot flushed with rose, reddish-orange, orange and pink. They bear from twelve to fifteen flowers on a spike. The individual flowers resemble those of *G. primulinus* in shape. The strain includes the following named varieties: 'Banshee,' 'Elf,' 'Ella Kelway,' 'Ghost,' 'Josephine Kelway,' 'Queen of the Fairies,' 'Sylph,' and 'Wraith.'

To *Nymphaea* 'Conqueror' (votes, 12 for, 2 against), from Leopold de Rothschild, Esq., C.V.O. (gr. Mr. J. Hudson, V.M.H.), Gunnersbury House, Acton. A beautiful large crimson water-lily, measuring 9 inches across, with a prominent golden centre. It is one of M. Marliac's hybrids. (Fig. 93.)

To *Nymphaea formosa* (votes, unanimous), from Leopold de Rothschild, Esq., C.V.O. (gr. Mr. J. Hudson, V.M.H.), Gunnersbury House, Acton. A lovely rosy-pink variety, measuring 8 inches across, with deep yellow centre. (Fig. 92.)

To *Patrinia palmata* (votes, unanimous), from Miss Willmott, V.M.H. (gr. Mr. C. R. Fielder, V.M.H.), Warley Place, Great Warley. A charming dwarf Chinese plant belonging to the Valerianaceae. It is said to be hardy, and produces an abundance of deep-yellow flowers in loose corymbs. Each flower has a short tube, and the corolla measures $\frac{3}{8}$ inch across. The pretty palmate leaves are light green, becoming tinged with reddish-brown when mature. (Fig. 124.)

Other Exhibits.

J. S. Arkwright, Esq., Presteign: *Lychnis Arkwrighti.*

Messrs. Bakers, Codsall: hardy plants.

Messrs. Barr, Taplow: hardy plants.

Messrs. Fells, Hitchin: Phloxes.

Countess Fortescue, South Molton: Pentstemon 'Apple Blossom'; Carnation 'Devonian.'

Mr. G. Godwin, Ryde: Geranium, 'King of the Purples.'

Guildford Hardy Plant Nursery, Guildford: hardy plants.

C. E. Heath, Esq., Holmwood: *Bignonia radicans major.*

Lady Ilchester, Dorchester: *Buddleia* sp. from China.

Mr. P. Ladds, Swanley: Pelargoniums.

Messrs. Littlewood & Butland, Plympton: Carnation 'Hetty Martin.'

Mr. J. E. Lowe, Warwick: Chrysanthemums.

R. C. R. Nevill, Esq., Chislehurst: Rose 'Isobel Nevill.'

Mr. L. R. Russell, Richmond: greenhouse plants.

Messrs. Wells, Merstham: Phloxes.

Floral Committee, July 26, 1912.

At Wisley.

Mr. H. B. May, V.M.H., in the Chair, and eight members present.

Awards Recommended :—

Award of Merit.

To Hollyhock 'Newport Pink Strain,' from Mr. H. A. Dreer, Philadelphia.

To Sweet Pea 'Hercules,' from Messrs. G. Stark, Great Ryburgh.

To Sweet Pea, 'Isobel Malcolm,' from Messrs. Dobbie, Edinburgh.

To Sweet Pea 'Mrs. Routzahn,' from Messrs. Dobbie, Edinburgh.

To Sweet Pea 'Premier,' from Messrs. G. Stark, Great Ryburgh.

To Sweet Pea 'Tennant Spencer,' from Messrs. Dobbie, Edinburgh.

To Viola 'Bessie,' from Messrs. Alex. Dickson, Newtownards.

To Viola 'Edina,' from Messrs. Dobbie, Edinburgh.

To Viola 'John Quarton,' from Messrs. Forbes, Hawick.

To Viola 'Jubilee,' from Mr. M. Cuthbertson, Rothesay.

To Viola 'Kingcup,' from Messrs. Alex. Dickson, Newtownards.

To Viola 'Lavender Queen,' from Mr. M. Cuthbertson, Rothesay.

To Viola 'Maggie Mott,' from Messrs. Dobbie, Edinburgh.

To Viola 'Mrs. Chichester,' from Mr. M. Cuthbertson, Rothesay.

To Viola 'Mrs. Davidson,' from Messrs. Forbes, Hawick.

To Viola 'Palmer's White,' from Mr. A. E. Palmer, Derby.

To Viola 'Snowflake,' from Mr. M. Cuthbertson, Rothesay.

To Viola 'Walter Welsh,' from Messrs. Dobbie, Edinburgh.

To Viola 'W. H. Woodgate,' from Messrs. Forbes, Hawick.

For descriptions of all the above see Reports of Wisley trials (pp. 271-287).

Floral Committee, July 30, 1912.

Mr. H. B. May, V.M.H., in the Chair, and nineteen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Messrs. Kelway, Langport, for Gladioli.

Silver-gilt Banksian Medal.

To Mr. J. Box, Lindfield, for Phloxes.

To Messrs. Ware, Feltham, for Phloxes and Pentstemons.

Silver Flora Medal.

To Messrs. May, Upper Edmonton, for Ferns, &c.

To Messrs. Veitch, Chelsea, for greenhouse plants.

Silver Banksian Medal.

To Messrs. Cannell, Swanley, for Cannas, Begonias, &c.

To Mr. Prichard, Christchurch, for hardy plants.

Bronze Flora Medal.

To Messrs. Wells, Merstham, for Phloxes and Carnations.

Bronze Banksian Medal.

To Messrs. A. and M. Jones, Malpas, for Sweet Peas.
To Messrs. H. J. Jones, Lewisham, for Phloxes.

Award of Merit.

To *Astilbe simplicifolia* (votes, unanimous), from Mr. G. Reuthe, Keston. A charming new and rare Japanese alpine plant, about 4 inches

FIG. 120.—ASTILBE SIMPLICIFOLIA. (*Gard. Chron.*)

high, bearing gracefully arched sprays of white flowers. The individual sprays measure 8 or 9 inches long. The leaves are small, serrate, palmate, and the plant is said to be very hardy. (Fig. 120.)

To *Begonia* 'Decorator' (votes, unanimous), from Messrs. Cannell, Swanley. A useful new bedding variety, with long, much-serrated leaves margined with red. The flowers, which are produced in great profusion, are pendulous, double, bright scarlet, and measure 2½ inches across when fully open. The plant is a strong grower.

To *Clethra arborea* (votes, 10 for, 4 against), from Messrs. Stuart Low, Enfield. This beautiful greenhouse shrub is a native of Madeira, from whence it was introduced into this country in 1784. The flowers are white, bell-shaped and five-petaled, and are borne freely in terminal compound racemes. The leaves are oblong, attenuated, lanceolate, glabrous on both surfaces, and serrated. (Fig. 125.)

To *Eschscholtzia* 'Mikado Caniculata' (votes, unanimous), from Mr. W. H. Gardiner, St. Osyth. A very fine variety of this popular hardy annual, having deep fiery-red flowers with prettily crinkled petals. It is said to be the result of crossing the variety 'Mikado' with *E. caniculata rosea.*

To Gladiolus 'Crown Jewel' (votes, 9 for, 4 against), from Messrs. Kelway, Langport. A very large, handsome variety, of a delicate rose-pink colour with a deep yellow blotch on the lower petal. In the bud state the colour is almost salmon-pink. Spike good. (Fig. 126.)

To *Haemanthus Andromeda* (votes, 9 for, 3 against), from R. Cory, Esq. (gr. Mr. Cobb), Duffryn, nr. Cardiff. A very handsome greenhouse plant, growing about 20 inches high, with a large roundish umbel of small reddish-orange flowers. The leaves are about 18 inches long by $4\frac{1}{2}$ inches broad, light green covered with spots at the base. The base of the flowering stem is also spotted.

To *Lysimachia Henryi* (votes, 14 for), from Mr. M. Prichard, Christchurch. A pretty creeping, hardy plant from N.W. China, bearing numerous heads of deep yellow, open, cup-shaped flowers. Leaves lanceolate, $1\frac{3}{4}$ inches long.

To *Rhododendron* × 'Clorinda' (votes, 10 for, 2 against), from Messrs. Veitch, Chelsea. A warm greenhouse variety of a lovely dull rose-pink colour. It is the result of a cross between *R. jasminiflorum carminatum* ♂ and *R.* × 'Minerva' ♀.

To Rose 'Danaë' (votes, unanimous), from Rev. J. H. Pemberton, Havering-atte-Bower. A charming new seedling Hybrid Tea of a creamy-white colour shading to pale apricot. It may be described as a perpetual cluster Rose, and is of branching, bushy habit. It grows about 5 feet high, and is said to be mildew-proof. The period of flowering extends from June to October.

Other Exhibits.

Waldorf Astor, Esq., Taplow: *Delphinium* 'Mrs. W. Astor.'

A. C. Bartholomew, Esq., Reading: *Delphinium macrocentron*, &c.

Messrs. Bees, Liverpool: Lobelia 'Blue Bees,' &c.

J. T. Bennett-Poë, Esq., Cheshunt: *Tweedia coerulea.*

Messrs. Cutbush, Highgate: Carnations.

L. Davidson, Esq., Twyford: Coleus.

Mr. C. Elliott, Stevenage: *Campanula americana* and Phlox 'Dainty Dame.'

Guildford Hardy Plant Nursery, Guildford: hardy plants.

Mr. C. Prosser, Hereford: seedling Pelargoniums.

Messrs. Rich, Bath: Phloxes and Pentstemons.
Miss Vickers, Romsey: Delphiniums.
Messrs. Webb & Brand, Saffron Walden: Hollyhocks.

Floral Committee, August 13, 1912.

Mr. H. B. May, V.M.H., in the Chair, and fifteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree, for cut trees and shrubs.

Silver Flora Medal.

To Messrs. Felton, Hanover Square, for Nelumbiums.
To Mr. L. R. Russell, Richmond, for Celosias and Fuchsias.
To Messrs. Wallace, Colchester, for Montbretias.
To Messrs. Ware, Feltham, for Pentstemons, &c.

Silver Banksian Medal.

To Messrs. May, Upper Edmonton, for Veronicas, &c.

Bronze Flora Medal.

To Messrs. Bide, Farnham, for Sweet Peas.

First-class Certificate.

To *Montbretia* 'Star of the East' (votes, 13 for), from Mr. G. Davison, Westwick, Norwich. This is a splendid acquisition, and is undoubtedly the finest Montbretia yet raised. The flowers measure 4 inches across and are of a lovely golden-orange colour. The buds are prettily tinged with scarlet. (Fig. 127.)

Award of Merit.

To *Cosmos* 'White Queen' (votes, 9 for, 2 against), from Messrs. Dobbie, Edinburgh. A beautiful white variety measuring 3½ inches in diameter, with a yellow centre. The seed was sown in March and the plants commenced to bloom on June 20. It will be much valued on account of its early flowering habit and its suitability for cutting.

To *Kniphofia* 'Unique' (votes, 7 for, 2 against), from Messrs. Wallace, Colchester. A most useful hardy plant, having numerous dense racemes of beautiful dull scarlet flowers. It grows to the height of 3 feet, and is of vigorous growth and early, free-flowering habit. It is a hybrid of *Kniphofia Nelsoni*, which it resembles in the foliage and slender spike.

To *Rhodostachys andina* (votes, 6 for, 3 against), from J. T. Bennett-Poë, Esq. (gr. Mr. Downes), Holmewood, Cheshunt. A stove-plant belonging to the Bromeliaceae, introduced from the Andes of Chile in 1850. The rose-coloured flowers, which are each subtended by an oval-oblong, cuspidate, toothed bract, are borne on a hemi-

FIG. 121.—CARNATION 'JOHN RIDD.' (*Douglas.*) (p. cl.)

[*To face p.* clviii.

FIG. 123.—CROSSANDRA UNDULAEFOLIA. (p. cliii.)

FIG. 125.—CLETHRA ARBOREA. (*Garden.*) (p. clvii.)

FIG. 126.—GLADIOLUS 'CROWN JEWEL.' (*Garden.*) (p. clvii.)

Fig. 127.—Montbretia 'Star of the East.' (*Gard. Mag.*) (p. clviii.)

FIG. 128.—CEREUS AMECAMENSIS. (*Garden.*) (p. cxxxii.)

[*To face p.* clix.

spherical receptacle, which is surrounded by a dense, regular rosette of long leaves 1-1½ foot long, each margined with spines; rigid, fleshy, and glaucous. The height of the plant is about 1 foot, and the orange anthers of the flowers are very noticeable.

Cultural Commendation.

To Messrs. Barr, Covent Garden, for *Acaena microphylla.*

Other Exhibits.

Messrs. Cannell, Swanley: Begonias and Coleus.
Mr. W. A. Cook, Horsham: *Eucryphia pinnatifolia*, **F.C.C.** 1880.
Mr. F. Dent, Mitcham: Chrysanthemums.
Messrs. Fells, Hitchin: rock garden.
Mr. W. H. Gardiner, St. Osyth: Aster 'White Swan.'
Guildford Hardy Plant Nursery, Guildford: hardy plants.
Mr. A. Ll. Gwillim, Sidcup: Begonias, &c.
Mary Countess of Ilchester: *Antigonon leptopus*, **A.M.** October 24, 1905, *Eichhornia crassipes.*
Messrs. Aldersey and Jones, Malpas: Sweet Peas.
Messrs. Kelway, Langport: Gladioli.
Mr. P. Ladds, Swanley: Pelargoniums.
T. Lilley, Esq., Clacton-on-Sea: Pentstemons.
Messrs. Low, Enfield: Carnations.
Mr. J. E. Lowe, Warwick: Chrysanthemum 'Early Beauty.'
Mr. A. Perry, Enfield: Delphiniums and Gladioli.
Herr W. Pfitzer, Stuttgart: Gladioli.
Mr. G. Reuthe, Keston: hardy plants.
Messrs. Strudwick, St. Leonards: Cactus Dahlia 'Wild Rose.'
Mr. J. Vert, Saffron Walden: Lobelia 'Blue Gown.'
Messrs. Warnaar, Sassenheim: Dahlias.
Messrs. Wells, Merstham: Phloxes.

Floral Committee, August 27, 1912.

Mr. H. B. May, V.M.H., in the Chair, and nineteen members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Mr. J. Box, Lindfield, for Phloxes, &c.

Silver Flora Medal.

To Messrs. Cannell, Swanley, for Dahlias.
To Messrs. Cutbush, Highgate, for hardy plants.
To Leopold de Rothschild, Esq., C.V.O. (gr. Mr. J. Hudson, V.M.H.), Gunnersbury House, Acton, for Nymphaeas.

Silver Banksian Medal.

To Messrs. Bunyard, Maidstone, for hardy plants.
To Messrs. Cheal, Crawley, for Dahlias.

To Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Aldenham House, Elstree, for Buddleias.

To Messrs. May, Upper Edmonton, for miscellaneous plants.

To Messrs. Piper, Bayswater, for Lilies.

To Messrs. Veitch, Chelsea, for miscellaneous plants.

Bronze Banksian Medal.

To R. R. Cory, Esq. (gr. Mr. Cobb), Duffryn, nr. Cardiff, for Dahlias.

To Mr. A. Ll. Gwillim, Sidcup, for Begonias and hardy plants.

First-class Certificate.

To *Cotoneaster divaricata* (votes, 11 for, 5 against), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Aldenham House, Elstree. A new Chinese shrub of dwarf spreading habit raised from seed collected by Mr. E. H. Wilson, V.M.H. The branches are flat and are furnished with small, ovate, dark green leaves. The most noticeable feature of this interesting plant is the abundant crop of long, cylindrical, dull red berries which it carries.

Award of Merit.

To Dahlia 'Antwerpia' (votes, unanimous), from Mr. J. B. Riding, Chingford. A variety of the 'Collarette' type measuring 5 inches across. The petals are broad, bright scarlet, with a patch of yellow at the base. The golden yellow centre is surrounded by a ring of small yellow florets.

To Dahlia 'Edith Carter' (votes, unanimous), from Mr. H. Shoesmith, Woking. A new seedling 'Cactus' variety of good form and moderate size. The florets are deep yellow tipped and streaked with crimson.

To Dahlia 'Irene' (votes, unanimous), from Messrs. Cheal, Crawley. A pretty lilac-rose 'Pompon' Dahlia measuring 2 inches across.

To Dahlia 'Leopold' (votes, unanimous), from Messrs. Cheal, Crawley. A deep crimson 'single' Dahlia measuring 3 inches across and having a golden yellow centre.

To Dahlia 'Marion' (votes, unanimous), from Messrs. Cheal, Crawley. A good 'single' variety measuring 3 inches across. The colour is rose shading to buff. The golden yellow centre is surrounded by a narrow ring of dark red.

To Dahlia 'Pegasus' (votes, 6 for, 3 against), from Messrs. Stredwick, St. Leonards. A 'fancy Cactus' variety with a greenish yellow centre and rose florets striped and spotted with crimson.

To Dahlia 'Princess Louise' (votes, unanimous), from Messrs. Dobbie, Edinburgh. A very pleasing variety of the 'Collarette' type nearly 5 inches across. The colour is a good dark scarlet with a ring of pale yellow florets round the golden yellow centre.

The above awards to Dahlias were recommended by a joint com-

mittee composed of members of the R.H.S. Floral Committee and members of the National Dahlia Society in equal numbers.

Other Exhibits.

Messrs. Burrell, Cambridge: Dahlia ' Unique.'

Mr. E. Dixon, Putney: hardy plants.

Messrs. Fells, Hitchin: hardy plants.

Mr. L. S. Harbutt, Leicester: Carnations.

Misses Hopkins, Shepperton: hardy plants.

Rev. Chalmers Hunt, Hitchin: Asters, Roses, &c.

Mrs. Hunter, Swalwell: Lobelia.

Mary Countess of Ilchester, Holland House, Kensington: ornamental crabs.

Sir Trevor Lawrence, Bart., Dorking: *Clerodendron coerulea*, Pentstemons, and Canna ' M. A. Astesiano.'

Messrs. Laxton, Bedford: Carnation ' Mrs. Laxton.'

H. J. Orchard, Esq., Watford: Ivy-leaf Geranium.

Messrs. Pennick, Delgany: *Escallonia organense Pennickii.*

Mr. A. Perry, Enfield: Delphiniums.

Mr. G. Reuthe, Keston: hardy plants.

Mr. L. R. Russell, Richmond: Celosias and Begonias.

Mr. M. V. Seale, Sevenoaks: Dahlias.

Messrs. Searle, Whittlesea: Chrysanthemum ' Early Crimson Queen.'

Messrs. Wells, Merstham: hardy plants.

ORCHID COMMITTEE.

May 14, 1912.

Mr. J. Gurney Fowler in the Chair, and twenty-one members present.

Awards Recommended :—

Silver Flora Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood), for a group of *Miltonia vexillaria* and other orchids.

To Mr. Sidney Flory, Tracy's Nursery, Twickenham, for Cattleyas, hybrid Odontoglossums, &c.

Silver Banksian Medal.

To de B. Crawshay, Esq., Sevenoaks (gr. Mr. Stables), for hybrid Odontoglossums and Odontiodas.

To Messrs. Hassall, Southgate, for Cattleyas and hybrids.

To R. G. Thwaites, Esq. (gr. Mr. G. M. Black), for Odontiodas and other hybrids.

To Messrs. McBean, Cooksbridge, for a group.

First-class Certificate.

To *Cymbidium* × *Woodhamsianum*, Fowler's variety (× *eburneo-Lowianum* × *Lowianum*) (votes, unanimous), from J. Gurney Fowler, Esq., Glebelands, South Woodford (gr. Mr. J. Davis). A very fine hybrid with flowers five inches across, and of a clear apricot-yellow colour with a band of chestnut-red inside the margin of the lip. (Fig. 131.)

Award of Merit.

To *Laeliocattleya* × 'Apollo' (*C. Schroderae* × *L.-c.* × *warnhamiensis*) (votes, 13 for, 2 against), from C. J. Lucas, Esq., Warnham Court, Horsham (gr. Mr. Duncan). A flower of good size; pale nankeen-yellow with orange disc, and pale pink front to the lip.

Cultural Commendation.

To Mr. W. H. White, Orchid-grower to Sir Trevor Lawrence, Bart., V.M.H., for *Dendrobium Loddigesii*. It is the *D. pulchellum* Hort., *D. Seidelianum* Reichb. f.

Other Exhibits.

Mrs. Norman C. Cookson, Oakwood, Wylam (gr. Mr. H. J. Chapman), *Odontoglossum* × 'Solon' var. 'Roland,' and *O. crispum*, blotched variety.

ORCHID COMMITTEE.

ROYAL INTERNATIONAL HORTICULTURAL EXHIBITION, MAY 22, 1912.

Baron BRUNO SCHRÖDER in the Chair, and fifteen members present.

Awards Recommended :—

First-class Certificate.

To *Laeliocattleya* × 'Lustre' var. 'Lavengro' (*L.-c.* × *callistoglossa* × *C. Luddemanniana*), from Lieut.-Col. Sir George L. Holford, K.C.V.O., Westonbirt (gr. Mr. H. G. Alexander). Flowers large, deep rose-pink. Lip purplish crimson, with yellow lines from the base. (Fig. 132.)

To *Dendrobium Dalhousianum luteum*, from Lieut.-Col. Sir George L. Holford. Flowers sulphur yellow with maroon disc to the lip.

To *Cattleya Mendelii* 'Queen Mary,' from Lieut.-Col. Sir George L. Holford. A charming white variety with a pale rose flush on the lip.

To *Cattleya* × 'Dirce' *magnifica* ('Miss Harris' var. 'Vulcan' × *Warscewiczii*), from Lieut.-Col. Sir George L. Holford. In its firm substance and outline this partakes strongly of its ancestor *C. Schilleriana*, but is of broader proportions. Colour light purple with darker veining. (Fig. 129.)

To *Brassocattleya* × 'The King' (parentage unrecorded), from Lieut.-Col. Sir George L. Holford. Flowers over nine inches across; deep rose purple with white disc to the fringed lip.

To *Laelia purpurata Schröderae*, from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). A fine pure white variety with a deep rose ray in the middle of the lip. (Fig. 130.)

To *Odontioda* × 'Mrs. F. M. Ogilvie' (*Odontoglossum* × *amabile* 'Royal George' × *Odontioda* × *Vuylstekeae*), from F. M. Ogilvie, Esq., The Shrubbery, Oxford (gr. Mr. Balmforth). Flower equal in size to *Odontoglossum crispum*; white, heavily marked with bright red and slightly flushed with rose.

To *Odontioda* × 'Queen Mary' (*Odontioda* × *Vuylstekeae* × *Odontoglossum* × *eximium*), from Messrs. Charlesworth. Flower of fine shape, deep red with clear white margin, and markings on the sepals. (Fig. 133.)

To *Odontoglossum* × 'Her Majesty' (parentage unrecorded), from Messrs. Charlesworth. A showy hybrid with dark purple blotching on a white ground; crest red and yellow. (Fig. 134.)

To *Miltonia* × *Hyeana* var. 'Vogelzang' (*Bleuana* × *vexillaria*), from Monsieur Firmin Lambeau, Brussels. Flowers large, and of fine shape; white, with a distinct yellow disc to the lip.

To *Odontoglossum* × *eximium* 'Excelsior' (*crispum* × *ardentissimum*), from Monsieur Charles Vuylsteke, Ghent. Sepals and petals violet-purple with white margin and tips. Lip white with large red blotches.

To *Odontoglossum* × *amabile* 'Duke of Portland' (*crispum* × *crispo-Harryanum*), from Messrs. Sander, St. Albans. A large flower with pink ground colour, evenly blotched with vinous purple.

To *Odontoglossum* × *eximium* 'King George V.' (× *ardentissimum* × *crispum*), from Messrs. Sander, St. Albans. Sepals and petals heavily blotched with purple, ground colour showing through; margin white. Lip white in front, blotched with red at the base.

Award of Merit.

To *Laeliocattleya* × 'Lustre' var. 'Buddha' (*L.-c.* × *callistoglossa* × *Luddemanniana*), from Lieut.-Col. Sir George L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander). Sepals and petals pale lilac; lip purplish-crimson; tube white with yellow lines.

To *Laeliocattleya* × 'Gladiator' (*C. Mossiae* × *L.-c.* × *callistoglossa*), from Lieut.-Col. Sir George L. Holford. Flower very large; rosy-lilac with crimson lip.

To *Laeliocattleya* × *Fascinator-Mossiae* (*L.-c.* × *Fascinator* × *C. Mossiae Reineckiana*), from Messrs. Charlesworth. Sepals and petals blush-white. Lip blotched with rose.

To *Laeliocattleya* × *Fascinator-Mossiae alba* (*L.-c.* × *Fascinator* × *C. Mossiae Reineckiana*), from Messrs. Charlesworth. Flowers pure white of good size and shape.

To *Odontioda* × 'Chanticleer' (*Odontioda* × *Cooksoniae* × *Cochlioda Noezliana*), from Messrs. Charlesworth. Flowers entirely deep scarlet.

To *Cattleya Mossiae* 'Madame Jules Hye,' from Monsieur Firmin Lambeau. An immense flower of fine shape; rosy-lilac with crimson markings on the lip, which has a light margin.

To *Odontioda* × *Bradshawiae* var. 'Vogelzang' (*Odontoglossum crispum* × *Cochlioda Noezliana*), from Monsieur Firmin Lambeau, Brussels. A pretty flower with whitish ground and rose margin, the inner parts of the segments blotched with rose-red.

To *Zygopetalum* × *Armstrongiae* (*Mackaii* × *rostratum*), from Messrs. Armstrong & Brown, Tunbridge Wells. Sepals and petals greenish, blotched with purple. Lip elongated, violet, darkest in the centre.

To *Odontoglossum* × *majesticum* var. 'Jas. Whitton' (× *eximium* × *percultum*), from Messrs Sander. Flowers large, white, heavily blotched with purple; petals fringed.

To *Odontoglossum crispum* var. 'Jas. McNab,' from Messrs. Sander. Flowers white, blotched reddish purple.

To *Odontoglossum* × *amabile* 'Princess Mary' (*crispum* × *crispo-Harryanum*), from Messrs. Sander. Flowers white, blotched with claret.

To *Odontoglossum* × *ardentissimum* var. 'Carmen' (*Pescatorei Charlesworthii* × *crispum Graireanum*), from F. M. Ogilvie, Esq. (gr. Mr. Balmforth). A very large form heavily blotched with purple and showing but little of the white ground colour.

To *Odontioda* × *Bradshawiae* var. 'Lady Colman' (*Odontoglossum crispum* × *Cochlioda Noezliana*), from Sir Jeremiah Colman, Bart, V.M.H. (gr. Mr. Collier). Flowers deep scarlet.

ORCHID COMMITTEE, JUNE 4, 1912.

Sir HARRY J. VEITCH in the Chair, and sixteen members present.

Awards Recommended :—

Gold Medal.

To Lieut.-Colonel Sir Geo. L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander), for a magnificent group of Laeliocattleyas, *Miltonia vexillaria*, &c.

Silver-gilt Flora Medal.

To H. S. Goodson, Esq., Putney (gr. Mr. G. E. Day), for Odontoglossums and fine hybrids.

Silver Flora Medal.

To Messrs. Sander, St. Albans, for hybrids and showy species.

To Messrs. Charlesworth, Haywards Heath, for hybrids, &c.

Silver Banksian Medal.

To Messrs. McBean, Cooksbridge, for a group.

To Messrs. Hassall, Southgate, for a group.

Bronze Banksian Medal.

To Messrs. Stuart Low, for a group.

To the Liverpool Horticultural Company, for hybrids.

To Mrs. Sidney Flory, for a group.

To Mr. A. W. Jensen, for Cattleyas and Odontoglossums.

First-class Certificate.

To *Miltonia vexillaria* 'Snowflake' (votes unanimous), from Lieut.-Colonel Sir Geo. L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander). The finest of the clear white forms of *M. vexillaria*. (Fig. 137.)

Award of Merit.

To *Odontoglossum* × *Lambeauianum* 'Princess Mary' (*Rolfeae* × *ardentissimum*) (votes unanimous), from H. S. Goodson, Esq. (gr. Mr. G. E. Day). Flowers white, effectively blotched with purple.

To *Odontoglossum* × 'Thais,' Glebe variety (parentage unrecorded) (votes 10 for, 2 against), from C. G. Phillips, Esq., Sevenoaks (gr. Mr. Bucknell). Flowers yellowish, blotched with purple.

To *Laeliocattleya* × 'Aphrodite,' Cowan's variety (*L. purpurata* × *C. Mendelii*) (votes unanimous), from the Liverpool Horticultural Company. A very fine form with blush-white sepals and petals, and dark purple front to the labellum.

To *Dendrobium Goldiei* (votes unanimous), from Messrs. Sander. The best form of *D. superbiens*, with fine spikes of rose-purple flowers.

Cultural Commendation.

To Mr. H. G. Alexander, gr. to Lieut.-Colonel Sir George L. Holford, K.C.V.O., for a magnificent plant of *Miltonia vexillaria* 'Snowflake,' with seventy-three flowers.

To Messrs. Armstrong & Brown, for *Coelogyne pandurata*, with a spike of sixteen flowers.

Other Exhibits.

de B. Crawshay, Esq.: Odontiodas.
W. Waters Butler, Esq.: *Cattleya Mossiae* 'The Queen.'
Walter Cobb, Esq.: hybrid *Odontoglossum*.
E. de Q. Quincy, Esq.: *Odontoglossum* × *Fascinator*.

ORCHID COMMITTEE, JUNE 18, 1912.

J. GURNEY FOWLER, Esq., in the Chair, and twenty-two members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Sander, St. Albans, for *Cattleya Warscewiczii Sanderiana* and hybrids.

Silver Flora Medal.

To E. H. Davidson, Esq., Twyford, for a group.
To R. G. Thwaites, Esq. (gr. Mr. G. M. Black), for Odontiodas.
To Messrs. Stuart Low, for a group.

Silver Banksian Medal.

To Messrs. Charlesworth, for rare orchids.

Bronze Banksian Medal.

To the Liverpool Horticultural Company, for Laeliocattleyas.

First-class Certificate.

To *Laeliocattleya* × 'Baroness Emma' (*L.-c.* × *eximia* × *C.* × *Hardyana*) (votes, unanimous), from Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill). Flower large and well rounded. Sepals and petals silver white, tinged and veined with rose-pink. Lip purplish-crimson, with yellow tube. (Fig. 138.)

To *Odontioda* × *Cooksoniae*, Fowler's variety (*Odontoglossum* × *ardentissimum* × *Cochlioda Noezliana*) (votes unanimous), from Messrs. Charlesworth. Flower in size equal to *Odontoglossum crispum*; deep blood-red with blush margins and tips. Lip white with a deep red blotch around the yellow crest. (Fig. 135.)

Award of Merit.

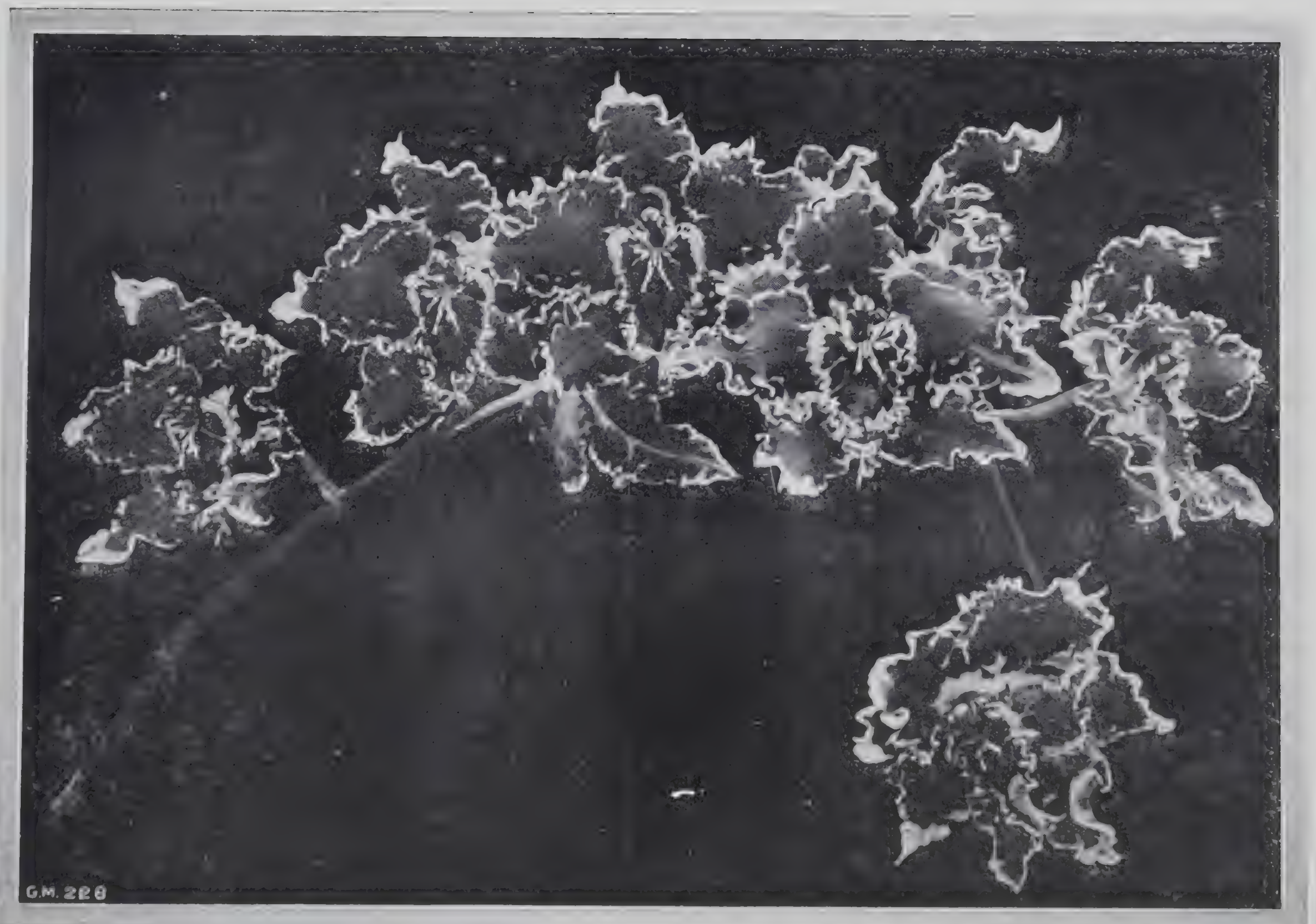
To *Miltonia* × *Bleuana* 'Rising Sun' (*Roezlii alba* × *vexillaria*) (votes, unanimous), from Baron Bruno Schröder (gr. Mr. J. E. Shill). Flower large, pure white, with a rayed mask of brownish-orange colour at the base of the lip.

FIG. 131.—CYMBIDIUM WOODHAMSIANUM, FOWLER'S VAR. (*Gard. Mag.*) (p. clxii.)

[*To face p.* clxvi.

Fig. 132.—Laeliocattleya 'Lustre' var. Lavengro. (*Gard. Chron.*) (p. clxiii.)

FIG. 133.—ODONTIODA × 'QUEEN MARY.' (*Charlesworth.*) (p. clxiii.)


G.M. 228

To *Odontonia* × 'St. Alban' (*Miltonia Warscewiczii* × *Odontoglossum Pescatorei*) (votes, unanimous), from Messrs. Sander, St. Albans. A very distinct hybrid, with the general characters of *O. Pescatorei* and its branched spike. Flowers pure white blotched with claret.

To *Laeliocattleya* × 'Ganymede,' Southfields variety (*L.* × 'Latona' × *C. Schroderae*) (votes, 12 for, 5 against), from W. Waters Butler, Esq., Southfields, Edgbaston (gr. Mr. Jones). Flower of medium size. Sepals and petals golden yellow; lip undulated at the margin, ruby-crimson.

FIG. 135.—ODONTIODA × COOKSONIAE, FOWLER'S VAR. (*Gard. Chron.*)

Other Exhibits.

Mr. E. V. Low: a group.

H. S. Goodson, Esq.: Odontoglossums.

Mr. W. A. Manda: *Cattleya Warscewiczii Mandaiana.*

W. Waters Butler, Esq.: *Laeliocattleya* × *Martinetti*, Southfields variety.

ORCHID COMMITTEE, JULY 2, 1912.

AT HOLLAND HOUSE.

Sir HARRY J. VEITCH in the Chair, and twenty members present.

Awards Recommended :—

Silver Lindley Medal.

To Mr. H. G. Alexander, orchid grower to Lieut.-Col. Sir George L. Holford, K.C.V.O., for a grand specimen of *Cattleya Warscewiczii*, Low's variety, with twenty-two blooms.

First-class Certificate.

To *Cattleya* × 'Artemis' (*Iris* × *Gaskelliana*) (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O., Westonbirt (gr. Mr. H. G. Alexander). A beautiful flower of perfect shape and fine substance. Sepals and petals light rose-pink; lip ruby-crimson, with a broad yellow disc on white ground. (Fig. 139.)

To *Cattleya* × *Dupreana*, The Dell variety (*Warneri* × *Warscewiczii*) (votes, unanimous), from Baron Bruno Schröder, Englefield Green. Resembling a gigantic *C. Warneri*, with the larger, expanded crimson-purple lip of *C. Warscewiczii*. Sepals and petals broad, deep rose; disc of the lip bright yellow; front crimson-purple. (Fig. 136.)

To *Miltonia* × *Hyeana* 'Le Conquerant' (*Bleuana* × *vexillaria*) (votes, unanimous), from Monsieur Jules Hye de Crom, Ghent. Flowers large, white tinged with rosy-lilac. Mask of lip deep purple.

Award of Merit.

To *Laeliocattleya* × *rubens* 'The Kaiser' (*L. pumila praestans* × *C.* × *Hardyana*) (votes, 17 for, 3 against), from E. H. Davidson, Esq., Borlases, Twyford (gr. Mr. Cooper). Plant of dwarf growth, with very large bright-rose flowers, having the labellums claret colour with chrome yellow disc.

To *Odontoglossum* × *percultum* 'King George' (*Rolfeae* × *ardentissimum*) (votes, 15 for, 6 against), from F. M. Ogilvie, Esq., The Shrubbery, Oxford (gr. Mr. Balmforth). A large white flower, profusely blotched with purple.

To *Brassocattleya* × 'Marion' (parentage unrecorded) (votes, unanimous), from Messrs. Jas. Veitch, Chelsea. A secondary hybrid of good shape, pale lilac, with purple lines on the front of the fringed lip.

To *Cattleya* × *Thurgoodiana* 'Apollo' (*Hardyana* × *Luddemanniana*) (votes, 15 for, 2 against), from Messrs. Stuart Low. Flower of very bright colour, and in most points resembling *C. Warscewiczii* derived through *C.* × *Hardyana*.

Other Exhibits.

Lieut.-Col. Sir G. L. Holford: specimen Orchids.
Sir Jeremiah Colman, Bart.: a group.
E. H. Davidson, Esq.: Cattleyas and hybrids.
J. Gurney Fowler, Esq.: Odontoglossums, &c.
Messrs. Charlesworth: a group.
Messrs. Mansell & Hatcher: a group.
Messrs. Jas. Veitch: Odontoglossums and hybrids.
Messrs. Stuart Low: a group.
Messrs. Sander: new hybrids.
Mr. H. A. Tracy: a group.
Mr. H. Dixon: a group.
Mr. W. J. Biggs: fine *Cattleya Mossiae Wageneri*.
Messrs. McBean: hybrid Orchids.

Orchid Committee, July 16, 1912.

Mr. J. Gurney Fowler in the Chair, and sixteen members present.

Awards Recommended :—

Gold Medal.

To Monsieur Firmin Lambeau, Brussels (gr. M. De Munter), for a fine specimen of the unique albino *Cattleya Warscewiczii alba* var. 'Firmin Lambeau.'

Silver Flora Medal.

To Messrs. Stuart Low, for a group.

Silver Banksian Medal.

To R. G. Thwaites, Esq., Streatham (gr. Mr. G. M. Black), for Odontiodas and other hybrids.

First-class Certificate.

To *Cattleya Warscewiczii alba* var. 'Firmin Lambeau' (votes, unanimous), from Monsieur Firmin Lambeau, Brussels. Flowers pure white, with light yellow disc to the lip. The first true albino of the species. (Fig. 140.)

Award of Merit.

To *Odontoglossum* × 'Epicaste' ('Clytie' × *crispum*, blotched variety) (votes, unanimous), from Messrs. Charlesworth. Flowers larger than those of *O. Thompsonianum*; claret colour, with rose margin and tips.

To *Zygopetalum* × *Brewii* (*Perrenoudii* × *rostratum*) (votes, unanimous), from Messrs. Charlesworth. Sepals and petals green tinged with purple. Lip carmine-rose, with broad white margin. Crest blue.

Other Exhibits.

Sir Trevor Lawrence, Bart.: *Eria rhyncostyloides.*

F. J. Hanbury, Esq.: *Brassocattleya* × 'Faith' (*B. Perrinii* × *C. Leopoldii*).

Baron Bruno Schröder: *Cattleya* × *Hardyana*, The Dell variety.

Messrs. Sander: *Odontoglossum crispum* 'Formidable.'

Orchid Committee, July 30, 1912.

Mr. J. Gurney Fowler in the Chair, and fifteen members present.

Awards Recommended :—

Silver Flora Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood), for a group of Cattleyas and rare species.

To Messrs. Stuart Low, Bush Hill Park, for a group.

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for rare Orchids.

To E. H. Davidson, Esq., Borlases, Twyford, for a group including a fine variety of *Vanda Sanderiana*.

To Messrs. McBean, Cooksbridge, for a group.

Cultural Commendation.

To Mr. W. H. White, Orchid-grower to Sir Trevor Lawrence, Bart., K.C.V.O., for a fine specimen of *Cypripedium* × 'W. R. Lee' (*Rothschildianum* × *superbiens*) with thirteen flowers.

Other Exhibits.

de B. Crawshay, Esq.: hybrid Odontoglossums.

Messrs. Jas. Veitch: *Brassocattleya* × 'Thesis' (*B. Digbyana* × *C. Aclandiae*).

Messrs. Sander: *Laeliocattleya* × 'Mauretania' (*Martinetii* × *Canhamiana*).

Mr. Sidney Flory: a small group.

ORCHID COMMITTEE, AUGUST 13, 1912.

Mr. J. GURNEY FOWLER in the Chair, and seventeen members present.

Awards Recommended:—

Silver Banksian Medal.

To E. H. Davidson, Esq., Borlases, Twyford, for a group.

First-class Certificate.

To *Laeliocattleya* × 'Glaucus' (*L. purpurata* × *L.-c.* × *rubens*) (votes, unanimous), from Lieut.-Colonel Sir George L. Holford, K.C.V.O., Westonbirt (gr. Mr. H. G. Alexander). Plant of dwarf habit; flower resembling *L.-c.* × *rubens*. Sepals and petals bright rosy-mauve with darker veinings. Lip ruby-red with yellow disc.

To *Laeliocattleya* × *Godmanii* (*C.* × 'Iris' × *L.-c.* × *callistoglossa*) (votes, unanimous), from F. Du Cane Godman, Esq., South Lodge, Horsham. Flower large and of fine substance. Sepals and petals broad, purplish-rose; lip plain-edged dark crimson with yellow base.

Award of Merit.

To *Laeliocattleya* × *luminosa* var. 'Mandarin' (*L. tenebrosa* 'Walton Grange' var. × *C. Dowiana aurea*) (votes, unanimous), from Lieut.-Colonel Sir George L. Holford, K.C.V.O. Sepals and petals chrome-yellow; lip claret colour.

To *Brassocattleya* × 'Ilene' (*C. Dowiana* × *B.-c.* × 'Madame Chas. Maron') (votes, unanimous), from Messrs. Jas. Veitch. A large, finely formed flower with clear rose-coloured sepals and petals; lip fringed, light rose with yellow disc.

To *Odontoglossum* × 'Empress Eugénie' (parentage unrecorded) (votes, unanimous), from E. H. Davidson, Esq., Borlases, Twyford. Flower large and broad in all the segments, white with a slate-blue ray on the petals and darker blotches of a similar colour on all the segments.

To *Odontoglossum* × *Fletcherianum* var. *nigrescens* (*Edwardii* × *cirrhosum*) (votes, unanimous), from Messrs. McBean, Cooksbridge. A nearly black form of the type which received an A.M., July 31, 1906.

Cultural Commendation.

To Mr. H. G. Alexander, Orchid-grower to Lieut.-Colonel Sir George L. Holford, K.C.V.O., for *Cattleya* × 'Tacitus' (*bicolor Grossii* × 'Germania' *superba*), with a many-flowered inflorescence on a 4-ft. growth.

Other Exhibits.

Sir Trevor Lawrence, Bart., K.C.V.O.: rare species.
Messrs. Charlesworth: a group.
Mr. Sidney Flory: a group.

ORCHID COMMITTEE, AUGUST 27, 1912.

Mr. J. GURNEY FOWLER in the Chair, and sixteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To E. H. Davidson, Esq., Borlases, Twyford, for rare species and hybrids.

Silver Flora Medal.

To Messrs. Sander, St. Albans, for Laeliocattleyas, Odontoglossums, &c.

Silver Banksian Medal.

To Messrs. Charlesworth, Haywards Heath, for rare Orchids.
To Messrs. Stuart Low, for a group.
To H. T. Pitt, Esq., Stamford Hill, for a group.

Award of Merit.

To *Odontioda* × 'Euterpe,' Davidson's var. (*Odontoglossum Uro-Skinneri* × *Cochlioda Noezliana*) (votes, 11 for, 1 against), from E. H. Davidson, Esq., Twyford. Flowers dark bronze-red, the lip having a mottled whitish zone.

To *Laeliocattleya* × *amabile*, Borlases var. (*C. Luddemanniana* × *L.-c.* × *Fascinator*) (votes, unanimous), from E. H. Davidson, Esq. Flowers large. Sepals and petals broad, white with a pearly blush. Front of the lip purple, disc yellow.

To *Odontoglossum* × 'Hélène' (parentage unrecorded) (votes, unanimous), from E. H. Davidson, Esq. Flowers of fine shape, white, heavily blotched with claret. Front of lip white.

To *Laeliocattleya* × 'Golden Fleece' (*L.-c.* × 'Golden Gem' × *C. Dowiana aurea*) (votes, unanimous), from Lieut.-Colonel Sir George L. Holford, K.C.V.O., Westonbirt (gr. Mr. H. G. Alexander). Inflorescence bearing nine flowers, bright yellow with ruby-red front to the lip.

To *Angraecum O'Brienianum* (votes, unanimous), from J. S. Bergheim, Esq., Belsize Court, Hampstead (gr. Mr. H. A. Page). A strong-growing species from Western Uganda. Flowers wax-like, white with greenish spurs; segments nearly equal. The plant bore six spikes of twelve to fifteen flowers each.

Cultural Commendation.

To Mr. H. G. Alexander, Orchid-grower to Lieut.-Colonel Sir George L. Holford, K.C.V.O., for *Cattleya* × 'Euphrasia,' Westonbirt var., with a spike of ten flowers.

Other Exhibits.

Messrs. McBean: a group.
Messrs. Armstrong and Brown: Cypripediums.
J. S. Bergheim, Esq.: *Bulbophyllum phoepogon Schlechter.*
Messrs. Mansell & Hatcher: three species.
Messrs. A. J. Keeling: various Orchids.
J. J. Neale, Esq.: *Epidendrum laterale.*

NARCISSUS AND TULIP COMMITTEE.

MARCH 5, 1912.

Mr. E. A. BOWLES in the Chair, and sixteen members present.

In reply to a question raised by Mr. P. R. Barr, the Chairman said the Australian growers were being communicated with for the purpose of dealing with the registration of daffodils raised in the Commonwealth.

It was agreed that the Dutch raisers be approached on the matter of registration, in the hope that a working arrangement might be arrived at for preventing the duplication of varietal names.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. Cuthbert, Southgate, for Tulips in pots.

Silver Flora Medal.

To Mr. Christopher Bourne, Simpson, Bletchley, for Daffodils.
To Messrs. Cartwright & Goodwin, Kidderminster, for Daffodils.

NARCISSUS AND TULIP COMMITTEE, MARCH 19, 1912.

Mr. E. A. BOWLES in the Chair, and eighteen members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Barr, Covent Garden, for Daffodils.

Silver-gilt Banksian Medal.

To Mr. Alex. M. Wilson, Bridgwater, for Daffodils.

Silver Flora Medal.

To Messrs. Bath, Wisbech, for Daffodils and Tulips.
To Mr. Christopher Bourne, Simpson, Bletchley, for Daffodils.

Award of Merit.

To Narcissus 'Helios' (votes, 15 for, 0 against). An *Incomparabilis* variety, golden yellow, with broad, yellow, orange-shaded crown (Division II., a) from Messrs. Walter T. Ware, Bath.

To Narcissus 'Rubellite' (votes, 15 for, 0 against). A white, red-centred *Poetaz* variety (Division VIII.), from Mr. Alex. Wilson, Bridgwater.

To Narcissus 'Robespierre' (votes, 16 for, 0 against). An *Incomparabilis* variety, with soft yellow perianth and bright orange crown (Division II., a), from Mr. Alex. M. Wilson, Bridgwater.

The new Peter Barr Memorial Cup was placed before the Committee, and it was suggested that the Council of the Royal Horticultural Society should be the custodians of the cup, and the Narcissus Committee should award it annually.

NARCISSUS AND TULIP COMMITTEE, APRIL 2, 1912.

Mr. E. A. BOWLES in the Chair, and nineteen members present.

A large number of new Daffodils were placed before the Committee.

Awards Recommended :—

Silver-gilt Flora Medal.

To Mr. Alex. M. Wilson, Bridgwater, for new Daffodils.
To Messrs. Barr, Covent Garden, for new Daffodils.
To Rev. G. H. Engleheart, V.M.H., Dinton, for new Daffodils.

Silver-gilt Banksian Medal.

To Messrs. Cutbush, Highgate, for Tulips.

Silver Flora Medal.

To Messrs. Cartwright & Goodwin, Kidderminster, for Daffodils.
To Miss F. W. Currey, Lismore, Ireland, for Daffodils.
To Mr. Christopher Bourne, Simpson, Bletchley, for Daffodils.
To Messrs. Bath, Wisbech, for Tulips and Daffodils.

Silver Banksian Medal.

To Messrs Pearson, Lowdham, Notts, for Daffodils.
To Mr. F. H. Chapman, Rye, for Daffodils.

First-class Certificate.

To Narcissus 'Croesus' (votes, 21 for, 0 against). A beautiful golden flower (Division II., a), from Mr. Alex. M. Wilson, Bridgwater.

Award of Merit.

To Narcissus 'Pedestal' (votes, 11 for, 0 against). A handsome variety, with white perianth and golden crown (Division II., b), from Mr. E. M. Crosfield, Bridgwater.

To Narcissus 'Killiecrankie' (votes, 20 for, 0 against). An *Ajax* variety, with creamy perianth and yellow trumpet (Division I., c), from Mr. E. M. Crosfield, Bridgwater.

NARCISSUS AND TULIP COMMITTEE, APRIL 16, 1912.

Mr. E. A. BOWLES in the Chair, and thirty members present.

Mr. H. B. May, V.M.H., on behalf of the Peter Barr Memorial Fund Committee, presented the handsome Peter Barr Memorial Cup to the Rev. G. H. Engleheart, V.M.H., for his creative work among Daffodils, the cup to be held by him for the ensuing year. Mr. Engleheart suitably acknowledged the honour conferred upon him.

Fig. 137.—Miltonia vexillaria 'Snowflake.' (*Jour. Horticulture.*) (p. clxv.)

Fig. 138.—Laeliocattleya × 'Baroness Emma.' (*Gard. Chron.*) (p. clxvi.)

FIG. 139.—CATTLEYA × 'ARTEMIS.' (*Gard. Chron.*) (p. clxviii.)

The first two-day Daffodil Show was held under the new arrangements. The brilliant sunshine and drying winds of the previous fortnight had proved exceptionally trying to Daffodils; consequently the exhibition was not so extensive, nor were the flowers of such high quality as the promoters had hoped.

Awards Recommended :—

Silver-gilt Flora Medal.

To Miss F. W. Currey, Lismore, Ireland, for Daffodils.
To Messrs. Barr, Covent Garden, for Daffodils and Tulips.

Silver Flora Medal.

To Messrs. Bath, Wisbech, for Daffodils and Tulips.
To Mr. H. D. Phillips, Olton, for Daffodils.

Silver Banksian Medal.

To Messrs. Cartwright & Goodwin, Kidderminster, for Daffodils.
To Mr. Christopher Bourne, Simpson, Bletchley, for Daffodils.

Award of Merit.

To Narcissus ' Mrs. Ernest H. Krelage ' (votes, 29 for, 0 against). A finely formed white trumpet variety (Division I., b), from Messrs. E. H. Krelage, Haarlem.

To Narcissus ' Silver Spangle ' (votes, 20 for, 4 against). A medium-sized variety with white perianth and soft yellow crown (Division IV.), from Mr. F. H. Chapman, Rye.

To Narcissus ' Seville ' (votes, 21 for, 0 against), with rich orange crown and white perianth (Division II., b), from Mr. H. D. Phillips, Olton.

NARCISSUS AND TULIP COMMITTEE, APRIL 30, 1912.

Mr. E. A. BOWLES in the Chair, and eleven members present.

The Committee agreed that a revision of the Classified Daffodil List was desirable, and the matter was left in the hands of the Chairman and Hon. Secretary.

Awards Recommended :—

Silver-gilt Flora Medal.

To Sir Randolf Baker, Bart., M.P., Ranston, Blandford (gr. Mr. A. E. Usher), for late-flowering Tulips.

To Messrs. Sutton, Reading, for late-flowering Tulips.

Silver-gilt Banksian Medal.

To Messrs. R. Wallace, Colchester, for Tulips.
To Messrs. Barr, Covent Garden, for Tulips.

Silver Flora Medal.

To Messrs. Bath, Wisbech, for Tulips.

Silver Banksian Medal.

To Messrs. Cartwright & Goodwin, Kidderminster, for Tulips.

Award of Merit.

To Darwin Tulip 'Velvet King' (votes, 10 for, 0 against). A dark, blackish maroon, Darwin variety, from Messrs. Barr, Covent Garden.

To Tulip 'Grenadier' (votes, 10 for, 0 against). A tall growing, large-flowered, orange-scarlet, yellow-based late variety, from Messrs. Walter T. Ware, Inglescombe, Bath.

NARCISSUS AND TULIP COMMITTEE, MAY 14, 1912.

Mr. E. A. BOWLES in the Chair, and ten members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Barr, Covent Garden, for late Tulips.

Silver-gilt Banksian Medal.

To Messrs. R. H. Bath, Wisbech, for late Tulips.

To Messrs. Hogg & Robertson, Dublin, for late Tulips.

Silver Flora Medal.

To Messrs. Alex. Dickson, Newtownards and Belfast, for late Tulips.

Silver Banksian Medal.

To Messrs. Jas. Veitch, Chelsea, for late Tulips.

Other Exhibit.

Tulip 'Walter Winans,' considered identical with 'Mrs. Farncombe Saunders' (**A.M.** May 17, 1904).

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TELEGRAMS : "HORTENSIA, SOUEST LONDON."

TELEPHONE : 5363 VICTORIA.

ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W.

NOTICES TO FELLOWS.

1. GENERAL.

Notices to Fellows are always added at the end of each number of the Journal, immediately preceding the Advertisements, and also at the beginning both of the "Book of Arrangements" and of the "Report of the Council." Fellows are particularly requested to consult these Notices, as it would often save them and the Secretary much needless correspondence.

2. LETTERS.

All letters on *all* subjects should be addressed—The Secretary, Royal Horticultural Hall, Vincent Square, Westminster, S.W.

3. TELEPHONE AND TELEGRAMS.

Telephone Number: **5363 VICTORIA.**

"**HORTENSIA, SOUEST LONDON,**" is sufficient address for telegrams.

4. JOURNALS WANTED.

The Secretary would be greatly obliged by the return to the Society of ANY NUMBERS of the JOURNAL which may be of no further use to Fellows. Complete sets are occasionally applied for, but, at the present moment, not even one can be supplied owing to the stock of the following being exhausted :—

VOLUME IV. Part 14.	VOLUME XIII. Part 1.
VOLUME V. Part 1.	VOLUME XIV.
VOLUME X.	VOLUME XV. Parts 2 and 3.

These are therefore particularly asked for.

5. SUBSCRIPTIONS.

All Subscriptions fall due on January 1st of each year. To avoid the inconvenience of remembering this, Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments ; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1st. It may be a week or more before the Tickets reach the Fellows, owing to the very large number (over 20,000) to be despatched within the first month of the year. Fellows who have not already given an order on their bankers for the payment of their subscriptions each year are requested to do so, as this method of payment is preferred, and saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society ; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society" and crossed "London County and Westminster Bank, Victoria Branch, S.W."

6. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Royal Horticultural Society, London, the sum of £..............., to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of

my decease; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

7. PRIVILEGES OF CHEMICAL ANALYSIS.

Instructions are contained at page 84 in the "Book of Arrangements," 1912.

8. LIST OF FELLOWS.

A list of all the Fellows of the Society is sent out in January. Fellows are requested to look at their own names in it, and if in any way these are incorrect, or the address insufficient, they are requested to inform the Secretary at once. Forms of Nomination, and of the Privileges of Fellows, are bound in with every number of the JOURNAL (Advt. pp. 32, 33) and the "Book of Arrangements."

9. NEW FELLOWS.

The President and Council fully appreciate how much the prosperity of the Society and its present large number of Fellows are due to the efforts of Fellows to enlist the sympathy of their friends; and the steady advance during recent years indicates the increasing recognition of the Society's work and usefulness. But it must not be supposed that a maximum has yet been reached. There is ample room for a great increase of Fellows, especially in America and the Colonies.

10. AN APPEAL.

What has been accomplished for the Society since 1887 is largely due to the unwearied assistance afforded by a small proportion of the Fellows; but as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially by:—

1. Increasing the number of Fellows.
2. Helping to swell the General Prize Fund started by Mr. A. W. Sutton, V.M.H., for providing Prizes for the Students at Wisley.
3. Providing lectures with lantern slides.
4. Presenting books to fill the gaps in the Library both at Vincent Square and at Wisley.
5. Sending new and rare Plants and Seeds for the Garden and surplus Roots for distribution to the Fellows.
6. Sending Plants for the *New Rock Garden* at Wisley.

Thus there is plenty for all to do according to their individual liking: personal effort, money, plants, books, are all alike needed. The Secretary asks those who read these lines to help in the ways above indicated.

Mr. C. Herman Senn, the Honorary Secretary of the Cookery and Food Association, has offered a Prize of £1 1*s.* to the Students at Wisley for the best essay on "How best to keep up through the year a continuous supply of Vegetables suitable to a private garden."

* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

11. R.H.S. GARDENERS' DIARY.

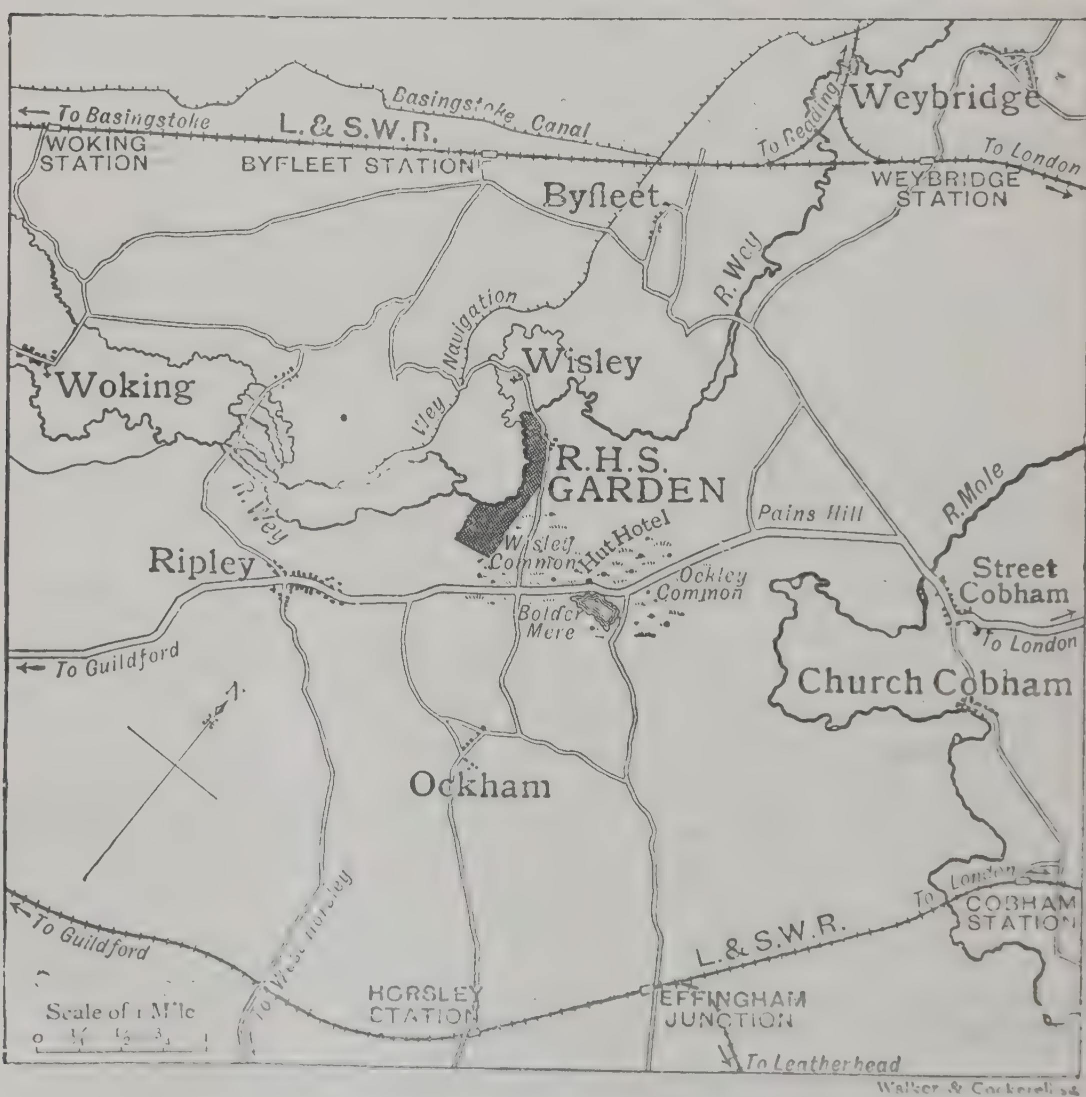
The R.H.S. Gardeners' Diary for 1913 will be issued in November. It will contain a considerable quantity of new information, and it has been compiled more especially for the single-handed gardener. The price is 1*s.* 1*d.*, post free, from the R.H.S. Office, Vincent Square, London, S.W.; or 2*s.* 1*d.* if leather-bound.

12. LINDLEY LIBRARY.

The Society, acting in and through its Council, having now become sole trustee of the Lindley Library, Fellows and friends of the R.H.S. have the encouragement of knowing that their gifts to the Library can never be lost to the Society, but are attached to it in perpetuity. It should now be the aim of all to make the Library far more perfect and complete than it is at present. Gifts of books, old or new, will be gratefully accepted.

13. THE SOCIETY'S GARDENS AT WISLEY.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till sunset, except on Sundays, Good



Position of the Society's Gardens.

Friday, Christmas Day, and Exhibition Days. Each Fellow's Ticket admits three to the Gardens. The Public are not admitted.

The Gardens, situated at Wisley (about 2 miles from Ripley, in Surrey), are about 3 miles from Byfleet, 3½ miles from Horsley, and 5½ miles from Weybridge, all stations on the South-Western Railway, with frequent trains from Waterloo and Clapham Junction. Carriages to convey four persons can be obtained by writing to Mr. D. White, fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge, waiting two hours at the Gardens, 8*s.*; or waiting three hours, 10*s.*; or to and from Horsley, 7*s.*; Effingham Junction, 7*s.*; Byfleet, 7*s.* Visitors should in all cases be careful to state the trains they intend to arrive by and leave by. Carriages can also be obtained at Weybridge for 8*s.* by writing to Mr. Trembling, New Road, Weybridge. Excellent accommodation and refreshments can be had at the Hut Hotel, close to the Gardens, and also at the Hautboy at Ockham.

The motor route from London to Wisley will be found in the "Book of Arrangements," p. 123.

14. ROCK GARDEN AT WISLEY.

In consequence of the rapidly increasing interest taken in what are popularly called "Alpine Plants," "Alpines," or "Rock Plants," the Council have constructed a Rock Garden at Wisley on a somewhat extensive scale. The idea is to obtain the best possible positions and soils for the different plants to grow in, the growth and well-being of the plants being considered to be of even greater importance than the artistic effect of the rockwork. In a Horticultural Society's Garden every single detail should teach something, so that Fellows visiting it may be able to take away an idea of how best to do this or that, or where best to plant this or that. The construction of the Rock Garden is completed, and the planting is proceeding, but it will be two, or possibly three, years or more before the plants on it can be seen at their best.

15. R.H.S. CUPS, 1913.

The Council have decided in future to adopt one special form of Cup for each year and to have it made in four different sizes for award at the 1913 Shows. The form adopted for next year will be illustrated in the "Book of Arrangements." The four different grades will be known as follows:—

1. The R.H.S. Silver-gilt Cup.
2. The R.H.S. Large Silver Cup.
3. The R.H.S. Silver Cup.
4. The R.H.S. Standard Cup.

16. TRIALS AT WISLEY IN 1913–14.

The Special Regulations for the direction of Trial Sub-Committees will be found on p. 31, "Book of Arrangements."

N.B.—Everything sent for trial *must be named*, and the name and address of the sender attached.

Fruit.

Strawberries, Autumn Fruiting.—20 runners of each.

Berry-bearing Fruits.—Three plants of each by February. Strawberries, Raspberries, Gooseberries and Currants excluded.

Flowers.

Antirrhinums.—Seed to be sent in February.

Aquilegias.—Seed to be sent in February.

Pyrethrums.—Seeds and plants to be sent in February.

Gaillardias.—Seeds and plants to be sent in February.

Violas.—Three plants of each to be sent at once. See notice below.

Bearded Flag or German Irises.—Two plants of each to be sent in July, 1913.

Vegetables.

Peas.—One pint of seed to be sent in February.

Potatos.—Early and mid-season. Each variety must be labelled as being "early" or "mid-season." Twenty tubers of each by February.

Tomatos.—Inside and out; one packet of seed to be sent in February.

Turnips.—One packet of seed to be sent in February.

The Wisley Viola Trial.

The trial of Violas has this year been so successful, particularly in the late spring and early summer, that it has been suggested (and the Council have accepted the suggestion) that the trial should be continued in 1913 with a special view to the date of the flowering of the various varieties. Growers, amateur as well as trade, are therefore requested to send three rooted cuttings of each variety (old as well as new), so that they may be planted before the third week in October.

Trial of Cape Pelargoniums.

The Council of the Royal Horticultural Society have been asked to endeavour to obtain an agreement on the Nomenclature of what are commonly known as Cape Pelargoniums. The only practical way known to the Council is to invite all growers of these plants to *at once* send cuttings (rooted or otherwise) with the name known to the sender attached, by post to the Superintendent, R.H.S. Gardens, Wisley, Ripley, Surrey. They will be potted up and next year be compared with each other, and with herbarium specimens, and printed records. No Zonals or Show or French Pelargoniums should be sent; only those known as 'Cape.'

If sent by post: The Superintendent, R.H.S. Gardens, Wisley, Ripley, Surrey.

If sent by rail: The Superintendent, R.H.S. Gardens, Wisley, Horsley Station, L. &. S.-W. R., with advice by post to the Superintendent.

17. THE WISLEY RESEARCH STATION.

Investigations are now in full swing at the new Research Station and Laboratory at Wisley. All communications relating to them should be

addressed to Mr. F. J. Chittenden, F.L.S., Director of the Research Work on Scientific Matters affecting Practical Horticulture, and Lecturer to the Students.

18. STUDENTS AT WISLEY.

N.B.—There will be a few vacancies for the two years' Course commencing in March, 1913. Early application should be made to the Secretary.

The Society admits young men, between the ages of 16 and 22 years, to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Horticulture, but also lectures, demonstrations, and Elementary Horticultural Science in the Laboratory, whereby a practical knowledge of simple Garden Chemistry, Biology, &c., may be obtained. The Laboratory is equipped with the best apparatus procurable for Students. The training extends over a period of two years, with a progressive course for each year. Students can only enter at the end of September or at the end of March. Selected Students have also the advantage of attending certain of the Society's Shows and Lectures in London.

19. DISTRIBUTION OF SURPLUS PLANTS.

In a past Report the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste-heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive such surplus plants? It was therefore decided to keep all plants till the early spring, and then give all Fellows alike the option of claiming a share of them by Ballot.

Fellows are therefore particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is permitted. The great majority also are, of necessity, *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the "Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is therefore obvious that when the Ballot is kind to any Fellow he will receive the

majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to fill up their application form before April 30 must be content to wait till the next year's distribution. The work of the Gardens cannot be disorganized by the sending out of plants at any later time in the year. All Fellows can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. The charge for this will be collected by the carriers on delivery of the plants, which will be addressed exactly as given by each Fellow on his application form. It is impracticable to send plants by post, owing to the lack of Post Office facilities for despatch without prepayment of postage.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled.

Plants cannot be sent to Fellows residing outside the United Kingdom, owing either to length of time in transit or to vexatious regulations in some foreign countries; but the Council will at any time endeavour to obtain for Fellows living abroad any unusual or rare seeds which they may have been unable to procure in their own country.

No plants will be sent to Fellows whose subscription is in arrear, or who do not fill up their forms properly.

20. EXHIBITIONS, MEETINGS, AND LECTURES IN 1912.

The programme will be found in the "Book of Arrangements" for 1912. An Exhibition and Meeting is held practically every fortnight throughout the year, and a short lecture on some subject connected with Horticulture is delivered during the afternoon.

A reminder of every Show will be sent in the week preceding to any Fellow who will send to the R.H.S. Offices, Vincent Square, S.W., a sufficient number (34) of halfpenny cards *ready addressed* to himself.

21. DATES FIXED FOR 1913.

Jan. 7, 21
Feb. 4, 11 (Annual Meeting only), 18
March 4 and 5 (Spring Bulbs), 18
April 1, 15 and 16 (Daffodils), 29
May 14 (Wednesday, not Tuesday), 20, 21 and 22 (Spring Show, Chelsea), 27–30 (Rhododendron Show)
June 3, 17
July 1, 2 and 3 (Holland House), 15, 17 (Sweet Peas), 29
Aug. 12, 26
Sept. 9, 11 (Roses), 23 (Vegetables)
Oct. 7, 9 and 10 (Fruit), 21
Nov. 4, 18
Dec. 2

22. SPRING AND SUMMER SHOWS, 1913.

(a) *Spring Show.*

It is with reluctance that the Council have found it necessary to change the site of the Spring Show. For some five-and-twenty years past the Society have enjoyed the hospitality of the Treasurer and Benchers of the Inner Temple, in whose gardens a series of wonderful Flower Shows have been held. The increasing attendance and consequent overcrowding in recent years have, however, compelled the Council to seek for a larger site; they have therefore accepted the invitation of the Governors of the Royal Hospital, Chelsea, to hold the Spring Shows in future on the same site as the recent International Horticultural Exhibition.

(b) *Summer Show.*

The Summer Show will be held at Holland House as usual, the dates being July 1, 2, and 3.

Details of both Exhibitions will be published in due course, and Fellows are asked to make them widely known and to do their utmost to induce the attendance of their friends.

23. RHODODENDRON SHOW, MAY 27-30, 1913.

Messrs. John Waterer and Sons, of Bagshot, have arranged to hold another exhibition of Rhododendrons in the Royal Horticultural Hall from May 27-30, 1913. Fellows' tickets will admit.

24. CHALLENGE CUPS.

Affiliated Societies' Cup.

A Ten-guinea Silver Cup is to be annually offered at the Society's Summer Show, to be competed for by Affiliated Societies. The Society winning the Cup is to hold it in perpetuity as the property of the R.H.S., but is to re-offer it annually at its own Shows for competition as a Challenge Cup. A Society may not win one of these Cups more than once in ten years, and it shall revert to the R.H.S. on the Affiliated Society ceasing to exist or ceasing to be affiliated. For further particulars see "Book of Schedules" for 1912.

For Vegetables.

A handsome Silver-gilt Challenge Cup has been presented to the Society by Messrs. Sutton, of Reading, and the Council will again offer it, with £10, for vegetables on September 23, 1913. The Society also offers a Champion Challenge Cup for the greatest number of points obtained by any one exhibitor throughout the same Exhibition, the winner of the Sutton Cup being excluded. These Cups may be won by the same exhibitor only once in three years, but he may compete every year for any second prize that may be offered.

25. SPRING SHOW OF BULBS AND ROCK PLANTS.

TUESDAY AND WEDNESDAY, MARCH 4 AND 5, 1913.

A Special Spring Exhibition of Forced Bulbs will be held on these days, the object being to demonstrate the varieties best suited for gentle forcing. Exhibits of small and large collections are invited from Amateurs and the Trade. R.H.S. Medals will be awarded according to merit.

(a) HYACINTHS, TULIPS, AND DAFFODILS.

The Council also offer (subject to the General Rules of the Society) the following Prizes presented to them by the General Bulb Growers' Society of Haarlem :—

Division I.—For Amateurs.

Class 3.—Eighteen Hyacinths, distinct.

1st Prize . .	£6 6*s*.	4th Prize . .	£3 3*s*.
2nd „ . .	£5 5*s*.	5th „ . .	£2 2*s*.
3rd „ . .	£4 4*s*.	6th „ . .	£1 1*s*.

Class 4.—Twelve Hyacinths, distinct.

1st Prize . .	£5 5*s*.	4th Prize . .	£2 2*s*.
2nd „ . .	£4 4*s*.	5th „ . .	£1 1*s*.
3rd „ . .	£3 3*s*.		

Class 5.—Six Hyacinths, distinct.

1st Prize . .	£2 2*s*.	3rd Prize . .	£1 1*s*.
2nd „ . .	£1 10*s*.	4th „ . .	10*s*.

Class 6.—Four pans containing Hyacinths, ten roots of one variety in each pan. The blooms of each pan to be of distinctly different colour from those of the other three pans. The bulbs need not have been actually grown in the pans they are shown in.

1st Prize . .	£4 4*s*.	3rd Prize . .	£2 2*s*.
2nd „ . .	£3 3*s*.	4th „ . .	£1 1*s*.

Division II.—For Trade Growers.

Class 7.—The finest decorative display of Hyacinths grown from first size bulbs.

Prize—The Gold Medal of the General Bulb Growers' Society of Haarlem.

Regulations.—For Classes 3, 4, and 5 each bulb must be in a separate pot (size optional). Classes 3, 4, 5, and 6 must be all single spikes; no spikes may be tied together. Exhibitors may compete in one only of the classes 3, 4, and 5. All bulbs must have been forced entirely in Great

Britain or Ireland. All varieties should be correctly named. Points will be deducted for all incorrect names.

(b) Bulbs grown in Moss Fibre.

Subject to the General Rules of the Society the Council also offer the following prizes, presented to them by Mr. Robert Sydenham.

Amateurs.

Classes 8-10.—Bulbs grown in Moss Fibre or similar material (not earth) and without drainage.

Class 8.—Six single Hyacinths, in separate vases, not exceeding six inches in diameter, to be selected from any one of the following varieties: 'Boerhave,' 'City of Haarlem,' 'Enchantress,' 'General Vetter,' 'Innocence,' 'Ivanhoe,' 'Jacques,' 'Johan,' 'King of the Blues,' 'Koh-i-Noor,' 'Lady Derby,' 'La Grandesse,' 'Queen Mary,' 'Schotel,' 'Totula,' 'Victory.'

Prizes, 21*s.*, 17*s.* 6*d.*, 15*s.*, 10*s.* 6*d.*, 7*s.* 6*d.*

Class 9.—Six vases of Tulips (vases not exceeding seven inches in diameter), no restriction as to the number of bulbs in a vase, to be selected from the following: 'Fabiola,' 'Joost van Vondel,' 'Keizerskroon,' 'La Rêve,' 'Mon Trésor,' 'Pink Beauty,' 'Prince of Austria,' 'Queen of the Netherlands,' 'Red Admiral,' 'Rose Luisante,' 'Van der Neer,' 'Vermilion Brilliant,' 'White Joost van Vondel.'

Prizes, 21*s.*, 17*s.* 6*d.*, 15*s.*, 10*s.* 6*d.*, 7*s.* 6*d.*

Class 10.—Six vases of Narcissi (vases not exceeding seven inches in diameter), no restriction as to the number of bulbs in a vase, to be selected from the following: 'Albatross,' 'Bianca,' 'Blood Orange,' 'Bullfinch,' 'Cardinal,' 'C. J. Backhouse,' 'Cresset,' 'Dairymaid,' 'Diadem,' 'Emperor,' 'Firebrand,' 'Glitter,' 'Gloria Mundi,' 'Golden Dell,' 'Goldfinch,' 'Horace,' 'Mrs. H. J. Veitch,' 'Lilian,' 'Lucifer,' 'Lulworth,' 'Madame de Graaff,' 'Seagull,' 'Victoria,' 'Wheatear,' 'White Lady,' 'Will o' the Wisp.'

Prizes, 21*s.*, 17*s.* 6*d.*, 15*s.*, 10*s.* 6*d.*, 7*s.* 6*d.*

If there are more than six exhibits in either of the classes an extra prize of 7*s.* 6*d.* will be given in such class if there are eight exhibits; a further 7*s.* 6*d.* if there are ten exhibits, and so on in the proportion of one prize for every two exhibits exceeding six in each class.

(c) GENTIAN CUP FOR ROCK PLANTS.

Amateurs.

The Council of the Royal Horticultural Society also offer (subject to the General Rules of the Society, and the special Regulations indicated below) a Silver Cup presented to them by Messrs. R. Wallace, of Colchester, for the best exhibit by an amateur of alpine plants, including suitable bulbs and dwarf shrubs, in a space not exceeding 5 feet by 3 feet.

The use of stone is not absolutely necessary, but the Judges will be

instructed to favour its correct use, and the natural arrangement of the plants in connexion therewith.

The plants may be either in pots or lifted.

26. THE CLARENCE ELLIOTT TROPHY FOR AN EXHIBIT OF ROCK-GARDEN PLANTS.

WEDNESDAY, MAY 14, 1913.

The Council offer (subject to the General Rules of the Society, and the special Regulations indicated below) a Silver Trophy presented to them by Mr. Clarence Elliott.

The Trophy is offered to Amateurs for an exhibit of Alpines and Plants suitable for a Rock Garden. The plants to be arranged with rockwork as a small Rock Garden on a space 6 feet by 3 feet.

There must not be less than 18 or more than 24 species or varieties. Herbaceous plants ordinarily exceeding 12 inches in height, bulbs, and variegated or double-flowered plants are excluded. The subjects shown need not all be actually in flower. All must have been grown by the Exhibitor since March 1 at least. Beauty of arrangement, the real suitability of the plants to rockwork, rarity, cultivation, and correct naming will be most taken into consideration by the Judges.

It is suggested that the plants should be grown in pots, not lifted from the open ground; but the pots should in all cases be removed before staging.

A background of dwarf shrubs and conifers may be added.

First prize, the Clarence Elliott Trophy. The Council will award a suitable medal according to merit, at their discretion, to the exhibitor adjudged second, and possibly also to the third.

27. THE FARRER SILVER CUP FOR ROCK PLANTS.

(OPEN.)

MAY 20-22, 1913.

The Council offer (subject to the General Rules of the Society, and the special Regulations indicated below) a Silver Cup presented to them by Mr. Reginald Farrer, for competition at the Chelsea Show.

Six new or rare dwarf Rock Plants, naturally about nine inches in height; not less than six or more than twelve specimens of each. New colour forms of well-known plants admissible—double flowers excluded. Variety, novelty, interest, and correctness of name to rank above size of specimens.

It is not essential that all, or even more than *one*, of any species should be in bloom, *e.g.*, no one would expect to have six *Saxifraga florulenta* in bloom simultaneously, but a group of it with a flower spike should take precedence of another without.

Every exhibitor must attach a card giving in print or in very clear writing the personal history of each set of plants (*e.g.*, whence he obtained the plant, or through whom, and when, its habitat, etc.), and

observation remarks (*e.g.*, ease or difficulty of cultivation, suitable soil, positions and uses, method of propagation, peculiarities, &c.).

	Points.		Points.
Novelty and Interest	20	Correctness of Name	20
Beauty	20	Personal History	
Garden Value	15	Quality of Observation Remarks	
Culture	10	Rarity	15

First Prize, the Farrer Cup in Silver, presented to the Society by Mr. Reginald Farrer. The Council will award suitable medals according to merit, at their discretion, to the exhibitor adjudged second, and possibly to the third.

28. CONFERENCES.

(a) *Orchids.*

A Conference on Orchids will be held in the Lecture Room at Vincent Square, S.W., on the second day of the Orchid Show, November 6, the times fixed being 11 A.M. to 1 P.M., and 2 P.M. to 4 P.M. The programme of the Conference will appear in due course.

(b) *Primulas.*

It has been decided to hold a Conference on Primulas in April, 1913, in the Lecture Room at Vincent Square, when Sir John Llewellyn, Bart., will occupy the Chair. Fuller particulars will be made known later.

29. EXAMINATIONS, 1913.

1. The Annual Examination in the Principles and Practice of Horticulture will be held on April 2, 1913. The Examination has two divisions, viz. (*a*) for Candidates of eighteen years of age and over, and (*b*) for Juniors *under* eighteen years. Particulars for 1913 may be obtained by sending a stamped and directed envelope to the Society's Offices. Copies of the Questions set from 1893 to 1910 (price 2*s*. post free) may also be obtained from the Office. The Society is willing to hold an Examination wherever a magistrate, clergyman, schoolmaster, or other responsible person accustomed to examinations will consent to supervise one on the Society's behalf.

The Examination will not be held outside the British Isles until further notice.

In connexion with this Examination a Scholarship of £25 a year for two years is offered by the Worshipful Company of Gardeners, to be awarded after the 1913 Examination to the student who shall pass highest, if he is willing to accept the conditions attaching thereto. The main outline of these conditions is that the holder must be of the male sex, and between the ages of 18 and 22 years, and that he should study gardening for one year at least at the Society's Gardens at Wisley, conforming to the general rules laid down there for Students. In the second year of the Scholarship he may, if he like, continue his studies at some other place at home or abroad which is approved by the Council of the Society. In case of two or more eligible Students being adjudged

equal, the Council reserve to themselves the right to decide which of them shall be presented to the Scholarship.

2. The Society will also hold an Examination in Cottage Gardening on April 23, 1913. This Examination is intended for, and is confined to, Elementary and Technical School Teachers. It is undertaken in view of the increasing demand in country districts that the Schoolmaster shall be competent to teach the elements of Cottage Gardening, and the absence of any test of such competence. The general conduct of this Examination is on similar lines to that of the more general Examination. Questions on Elementary Chemistry and Biology are included in this Examination.

3. The Society will hold an examination in the Royal Horticultural Hall, Vincent Square, S.W., on Monday, January 6, 1913, for gardeners employed in Public Parks and Gardens belonging to County Councils, City Corporations, and similar bodies. Entries close on December 30, 1912.

Medals and Certificates are awarded and Class Lists published in connexion with these Examinations. The Syllabus may be obtained on application to the Secretary, R.H.S., Vincent Square, London, S.W.

30. INFORMATION.

Fellows may obtain information and advice from the Society as to the names of flowers and fruit, on points of practice, insect and fungoid attacks, and other questions, by applying to the Secretary, R.H.S., Vincent Square, Westminster, S.W. Where at all practicable it is particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the Fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

31. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost, viz. a fee of £3 3*s.* for one day (or £5 5*s.* for two consecutive days), together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their gardens. Gardens can only be inspected at the *written* request of the *owner*.

Nota Bene.—The work of inspecting Fellows' gardens and advising thereupon has increased so much of recent years, and has necessitated Mr. Wright's absence from the Wisley Garden so often, that the Council of the Society have long felt the desirability of appointing an Inspector of Fellows' gardens who should be entirely independent of the Wisley staff, thus leaving Mr. Wright free to devote his whole time to the Society's Garden and to the Society's Shows.

The very great difficulty of finding an Inspector who should not only be as efficient and capable as Mr. Wright, and one who is also in constant touch with a fine garden and all the newest additions to horticulture, has

at last been overcome by the kindness of Miss Willmott, of Warley, who has consented to her head gardener, Mr. C. R. Fielder, V.M.H., being appointed Inspector to the Society and at the same time allowing him to remain in constant daily touch with her celebrated garden at Warley Place.

From May 1, therefore, Mr. C. R. Fielder, V.M.H., so well and honourably known in gardening circles, will be the Royal Horticultural Society's Inspector to visit Fellows' gardens, and to advise thereupon on the terms mentioned on page 8 of the "Book of Arrangements," 1912. All requests for the Inspector's services should be made to the Secretary, R.H.S. Office, Vincent Square, Westminster, S.W.

32. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many new branches of work undertaken since the reconstruction of the Society in 1887 is the unification of local Horticultural Societies by a scheme of affiliation to the R.H.S. Since this was initiated no fewer than 300 Societies have joined our ranks, and the number is steadily increasing.

To the privileges of Affiliated Societies have been added all the benefits accruing under the scheme recently introduced for the Union of Horticultural Mutual Improvement Societies.

Secretaries of Affiliated Societies can obtain on application a specimen of a Card which the Council have prepared for the use of Affiliated Societies for Certificates, Commendations, &c. Price 3*s.* 6*d.* for 10 copies, 5*s.* 6*d.* for 20, 11*s.* 6*d.* for 50, 20*s.* for 100.

The Council have also struck a special Medal for the use of Affiliated Societies. It is issued at cost price in Bronze, Silver, and Silver-gilt—viz. Bronze, 5*s.* 6*d.*, with case complete; Silver, 12*s.* 6*d.*, with case complete; Silver-gilt, 16*s.* 6*d.*, with case complete. Award Cards having the Medal embossed in relief can be sent with the Medal if ordered, price 6*d.* each.

33. CARDS FOR EXHIBITS OF VEGETABLES, &c., INDICATING THE POINTS CONSTITUTING GOOD QUALITY.

Affiliated Societies' Exhibitions.

As an outcome of a suggestion made to the Secretary by an Affiliated Society, the descriptions of "excellence" of various fruits and vegetables, appearing in the R.H.S. Code of Rules for Judging, have been printed on stiff cards, thus:

ROYAL HORTICULTURAL SOCIETY.

Rules for Judging: Section 100.

Carrots.—Of medium size according to variety;
Good and even form;
Skin and colour clear and bright;
Free from side roots;
Flesh tender.

Points 8.—	Form and Colour	3
	Condition	2
	Uniformity	2
	Size	1

The intention is that these cards should be put up conspicuously at Affiliated Societies' Shows amongst the exhibits of vegetables, &c., referred to. Their educational value will be at once apparent, for visitors, instead of viewing the exhibits with little or no idea of what constitutes excellence, will have before them, near each exhibit, the "points" from a Judge's standpoint. Thus they will see for themselves where an exhibit has succeeded or failed, and in what direction their own efforts should be turned if they are to become prize-winners.

There are 25 cards in the set, and the subjects dealt with are Carrot, Kale, Leek, Beans, Cucumber, Cauliflower, Beet, Radish, Celery, Pea, Spinach, Tomato, Rhubarb, Cabbage, Brussels Sprouts, Potato, Parsnip, Vegetable Marrow, Lettuce, Turnip, Onion, &c. The price is 7*s.* 6*d.* a set, from the Secretary, R.H.S., Vincent Square, S.W.

34. UNION OF HORTICULTURAL MUTUAL IMPROVEMENT SOCIETIES.

This Union has been established for the encouragement and assistance of Horticultural Mutual Improvement Societies, the object being to strengthen existing Societies, to promote interchange of lecturers, to provide printed lectures, and if possible to increase the number of these useful Societies.

A list of lecturers and their subjects, and a list of typewritten lectures, with or without lantern slides, prepared by the Society, may be obtained from the Secretary, R.H.S., price 3*d.*

Lantern slides on horticultural topics are much needed, and their gift will be very much appreciated.

35. RULES FOR JUDGING—1911 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," have been revised, and the new edition is now ready. Special attention is drawn to the amended Rule defining "an amateur," with suggestions for establishing four distinct classes of amateurs to meet the requirements of larger or smaller local Societies. (See also p. 168, "Book of Arrangements.") The "pointing" recommended for fruits and vegetables has also been considerably amended, and the terms "annuals" and "biennials" further explained. The secretaries of local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1*s.* 6*d.*, addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W.

Exhibitors of vegetables are specially warned that the numbers of specimens to a dish appearing on p. 19 of the 1909 Code of Rules have been still further modified.

36. SPRAYING OF FRUIT TREES.

The Report of the Conference on the Spraying of Fruit Trees, held in the R.H.S. Hall on October 16, 1908, may still be obtained at the Society's Offices, Vincent Square, Westminster, price 1*s*. The book deals with the methods of spraying fruit trees for both insect and fungus pests, with information as to washes and spraying machinery, and forms the latest collated information on this subject.

37. VARIETIES OF FRUITS.

Many people plant fruit trees without a thought of what variety they shall plant, and as a result almost certain disappointment ensues, whilst for an expenditure of 2*d*. they can obtain from the Society a little 16-page pamphlet which contains the latest expert opinion on Apples, Pears, Plums, Cherries, Raspberries, Currants, Gooseberries, and Strawberries, together with Notes on Planting, Pruning, and Manuring, which for clearness of expression and direction it would be impossible to surpass. It has in fact been suggested that no other 16 pages in the English language contain so much and such definite information. At the end of the pamphlet are given the names of some of the newer varieties of fruits, which promise well, but are not yet sufficiently proved to be recommended for general planting.

Copies of this pamphlet for distribution may be obtained at the Society's Office, Vincent Square, Westminster. Price, post free: single copy, 2*d*., or 25, 2*s*.; 50, 3*s*.; 100, 4*s*.

38. PLANTS CERTIFICATED.

The last-published list of "Plants Certificated by the Society" commenced with the year 1859 and closed with 1899. A further 11 years have now passed and the Council have republished the list up to the end of 1910, constituting a record of all the plants which have received awards during the past 50 years. The completed list will be of great assistance to amateurs and an absolute necessity to raisers and introducers of new plants. It is now ready, price 2*s*. post free, not including Orchids.

Orchids Certificated.

The list of awards made to Orchids, with parentage, &c., has recently been published separately, and may be obtained at the Society's Office, Vincent Square, Westminster, bound in cloth and interleaved, price 5*s*. net.

39. RECOGNITION OF DILIGENT INTEREST IN PLANTS.

The Council have founded a card of "Recognition of Diligent Interest in Plants." Issued in response to frequent applications by school authorities for some token of encouragement of work with plants amongst scholars, it is to be awarded to the boy or girl (or both) who, in the yearly school competitions in plant cultivation, or garden-plot keeping,

or Nature study, has secured the first prize. The cards are 12 inches by 8 inches, and may be had on application to the Secretary, R.H.S., Vincent Square, London, S.W. (price 6*d*. each). The application should contain information as to (*a*) the nature of the competition, (*b*) the number of competitors, (*c*) the judges, (*d*) the number of prizes awarded in the competition, (*e*) the full name of the first prize winner, and should be signed by the head teacher and a member of the education authority concerned. The Council of the R.H.S. will at their own absolute discretion grant or withhold this "recognition."

40. MS. FOR JOURNAL.

The Editor is always glad to receive suitable articles for issue in the JOURNAL from corresponding and other Fellows of the Society. It is thought that much more might be done in this direction to disseminate valuable botanical and horticultural information, and to publish records of work and research conducted by other than actual official members of the Society. The JOURNAL is received by the best libraries in the world, and is regularly sent to all the 13,000 Fellows of the Society.

41. PLACES FOR GARDEN BOYS WANTED.

The Secretary of the Kensal House School for Tuberculous Children draws our attention to the great kindness it would be if we could hear of any places suitable for boys of 14 to 16 years leaving this institution and desiring to take up garden work. Address, Herbert Woollcombe, Esq., 37 Sutherland Avenue, London, W.

42. ADVERTISEMENTS.

Fellows are reminded that the more they can place their orders with those who advertise in the Society's Publications the more likely others are to advertise also, and in this way the Society may be indirectly benefited.

EXTRACTS FROM THE PROCEEDINGS

OF THE

ROYAL HORTICULTURAL SOCIETY.

DEPUTATION TO THE CENTENARY SHOW OF THE GLASGOW AND WEST OF SCOTLAND HORTICULTURAL SOCIETY.

September 4, 1912.

A deputation consisting of Sir Daniel Morris, K.C.M.G., V.M.H., Sir Harry Veitch, V.M.H., Mr. H. B. May, V.M.H., Mr. James Hudson, V.M.H., and the Assistant Secretary, attended the Centenary Show of the Glasgow Horticultural Society on September 4, 1912.

Arriving at the Central Station, Glasgow, in the evening of September 3, the deputation met with a most cordial reception at the hands of Mr. Thomas Wyllie, the Chairman of the Directors, Mr. Craig D. Riddell, the Vice-Chairman, Mr. D. G. Purdie, a member of the Committee, Mr. Hugh M. Mackie, the Secretary, and Mr. Whitton, the Chief Superintendent of the Glasgow Public Parks.

Despite the very wet and boisterous weather, an excellent Show was opened by the Countess of Glasgow in the Bunhouse Skating Rink and the grounds adjoining, Sir John Stirling-Maxwell, Bart., of Pollok, in the Chair, supported by Lord Provost Stevenson. Several excellent groups were staged, and the competitive classes had many entries. The deputation made Awards of the Society's Medals and Cups in accordance with the subjoined list.

After the luncheon, the deputation, together with the members of the Reception Committee, paid a visit by invitation to Auchendennan, the residence of W. J. Chrystal, Esq., on the banks of Loch Lomond. Mrs. Chrystal entertained them at tea with much hospitality, and later the party inspected the beautiful grounds with their magnificent trees, and the rock, wild, and water gardens, with a view of the Loch and the distant Ben Lomond at every point. The deputation brought away with them most pleasant memories of their host's and hostess's kind entertainment. In the evening the deputation were the guests at dinner of the officials of the Glasgow Horticultural Society, at the Central Station Hotel.

Thursday, September 5, was devoted to an inspection of the Public Parks and Gardens of Glasgow, under the guidance of Mr. Whitton and Mr. Bailie J. Steele. The Botanic Gardens were visited first. These

created a very favourable impression, the magnificent tree ferns in the large conservatory and the charming Filmy fern and Moss house being especially admired. Springburn Park was next visited, and then the deputation returned to the City Chambers for luncheon, which again was an occasion of hospitality—this time at the hands of Lord Provost Stevenson and the Parks Committee. The deputation were received with warmth, and handsomely entertained. The Lord Provost was supported by Mr. Bailie Dunlop, the Chairman of the Parks Committee, Mr. Bailie Stuart, and the Town Clerk, Mr. John Lindsay.

Proposing the toast of the "R.H.S. Deputation," Mr. Bailie Dunlop said that the City of Glasgow felt extremely flattered that such an influential deputation had been sent, and he was convinced that the visit would act as a further incentive to horticulture in the West of Scotland. Sir Daniel Morris, K.C.M.G., in replying, said that the Centenary Show was one of which the City might well be proud, and hoped that a way would be found by the Corporation to give its support to the work of the Society, which might be made one of the most influential in Great Britain and a real power for the extension of horticulture in the West of Scotland.

Sir Harry Veitch in proposing "The Corporation of Glasgow" referred to the splendid work being done in the improvement and extension of the City Parks and Gardens under the management of the Parks Committee and Mr. Whitton, and hoped the time was not far distant when the Glasgow Horticultural Society would be in a position to occupy its own hall for the Shows. He emphasized the need to adhere strictly to the true purpose for which the Society existed—viz. horticulture pure and simple.

Mr. Bailie Stuart acknowledged the compliment paid to the Corporation, and said the reference to Mr. Whitton was well deserved, and hoped that the remarks of Sir Daniel Morris would not fall on barren ground.

Luncheon finished, the tour of the parks was resumed after a visit had been paid to the Cathedral, and so in turn Hillcross Gardens, Glasgow Green, Queen's Park, Rouken Glen Park, and Bellahouston Park were seen. The deputation were very favourably impressed with all they saw—the generally excellent upkeep under the unfavourable conditions of a smoke-laden atmosphere, the winter gardens and conservatories which were features of most of the parks, and the natural beauties of Rouken Glen; and they wish to record their high appreciation of the work being done by Mr. Whitton and the Parks Committee of Glasgow.

[Since the writing of the above a very cordial letter of thanks for the deputation has been received from the Glasgow Society, containing the following passage: "My Directors, I know, are thoroughly satisfied that the visit of the deputation will do the Society in its work much permanent good, and they greatly appreciate the fact that the Royal Horticultural Society thought fit to send such an influential deputation to our Show."]

The following are the Awards made by the deputation:—

Gold Medal.

To Messrs. Sutton, Reading, for fruit and vegetables.
To Messrs. J. Veitch, Chelsea, for stove, &c., plants.

Silver Cup.

To Messrs. Malcolm Campbell, Glasgow, for a table of fruit.
To Messrs. Dobbie, Edinburgh, for Roses, and herbaceous flowers.
To Messrs. May, Edmonton, for ferns.
To Messrs. Blackmore and Langdon, Bath, for Begonias.

Silver-Gilt Knightian Medal.

To Messrs. Clibrans, Altrincham, for vegetables.

Silver-Gilt Flora Medal.

To Messrs. Austin and McAslan, Glasgow, for stove plants.

Silver-Gilt Banksian Medal.

To Messrs. Webb, Wordsley, for fruit, flowers, &c.
To Mr. D. G. Purdie, Glasgow, for stove plants.
To Messrs. Hugh Dickson, Belfast, for Roses.

Silver Hogg Medal.

To the Rt. Hon. Lord Rowallan, Kilmarnock (gr. Mr. J. Dixon), for Grapes.

Silver Knightian Medal.

To His Grace the Duke of Portland, K.G., Welbeck (gr. Mr. J. Gibson), for vegetables.

Silver Flora Medal.

To the Rt. Hon. the Earl of Home, Douglas Castle (gr. Mr. A. McMillan), for foliage plants.
To Colonel Stewart Richardson, Stanley (gr. Mr. J. E. Davis), for foliage plants.
To Messrs. Cutbush, Highgate, London, for Carnations.
To Messrs. M. Campbell, High Blantyre, for Dahlias.
To Mr. John Fletcher, Auchenheath, Lanarkshire, for Sweet Peas.
To Mr. J. Smellie, Busby, for Dahlias and Chrysanthemums.

Silver Banksian Medal.

To W. P. MacLellan, Esq., Helensburgh (gr. Mr. H. MacSkimming), for Grapes.
To Mr. W. Ferguson, Brucefield, Dunfermline, for Roses.
To Mr. C. Pattison, Linwood, for herbaceous flowers.
To Messrs. Wells, Merstham, for cut-flowers.
To Messrs. Cunningham Fraser, Edinburgh, for cut-flowers.
To Mr. S. A. Jones, Kilkenny, for Gladioli.
To Messrs. Young, Hatherley, for Carnations.

To Messrs. G. Mair, Prestwick, for Gladioli.
To Messrs. Austin and McAslan, Glasgow, for vegetables.

GENERAL MEETING.

SEPTEMBER 10, 1912.

Mr. JAMES HUDSON, V.M.H., in the Chair.

Fellows elected (20).—A. Ainscough, J. W. Barker, J. R. Bell, Thomas Brocklebank, D.L., Mrs. Briscoe Eyre, T. W. Fisher, S. A. Jones, E. J. Keeble, J.P., H. W. Monington, F.L.S., Mrs. Arthur Napier, W. W. Petrie, H. H. Pine, R. Ramsden, George W. Ridgewell, Major H. Ross-Johnson, J. W. Shelton, S. A. Styles, G. W. Swire, J. M. Wale, H. D. Wittrick.

A lecture on "Scented Pelargoniums" was given by Miss Troyte-Bullock. (See p. 497.)

GENERAL MEETING.

SEPTEMBER 24, 1912.

Mr. W. A. BILNEY, J.P., in the Chair.

Fellows elected (17).—Claude Askew, E. L. Churchill, S. Cunningham, J. M. da Costa, Mrs. F. L. Gibbs, H. L. Hammond, George Hussey, Mrs. H. Menzies, E. W. Morgan, Mrs. Sutherland Orr, W. Penn, Captain J. R. Prickett, B. Read, F. A. Salter, J. H. Whittaker, Mrs. Victor Williams, H. Wooding.

Fellows resident abroad (3).—J. Anderson (Queensland), C. Ross (Queensland), A. W. White (N.S.W.).

A lecture on "How to Cook some Roots and Tubers" was given by Mr. C. Herman Senn. (See p. 540.)

EXHIBITION OF VEGETABLES.

HELD IN THE SOCIETY'S HALL, VINCENT SQUARE, S.W.
SEPTEMBER 24, 1912.

THE JUDGES.

Bates, W., Cross Deep Gardens, Twickenham.
Cheal, A., Lowfield Nurseries, Crawley.
Fielder, C. R., V.M.H., Warley Place Gardens, Essex.
Pearson, A. H., V.M.H., The Hut, Lowdham, Notts.
Poupart, W., Marsh Farm, Twickenham.
Thomas, O., V.M.H., 25 Waldeck Road, West Ealing.

THE REFEREES.

Bunyard, G., V.M.H., Royal Nurseries, Maidstone.
Cheal, J., Lowfield Nurseries, Crawley.
Hudson, J., V.M.H., Gunnersbury House Gardens, Acton.
Pope, W., Welford Park Gardens, Newbury, Berks.

OFFICIAL PRIZE LIST.

This Exhibition was open to Amateurs only

The Owner's name and address and the Gardener's name are entered on the first occurrence, but afterwards only the Owner's name is recorded.

Collections.

N.B.—A competitor can only enter in one of the first three classes. Arrangement will be taken into consideration by the Judges.

Class 1.—12 kinds distinct to be selected from the subjoined list. Number of specimens to be as stated in the Rules. Beet, Brussels Sprouts, Cabbage, Broccoli or Cauliflower, Carrots, Celery, Cucumbers, Endive, Leeks, Lettuce, Mushrooms, Onions, Parsnips, Peas, Potatos, Tomatos, Turnips, Beans, Runner or French, Vegetable Marrow.

First Prize, The Sutton Challenge Cup (Value £21) and £10.
Second, £5; Third, £3; Fourth, £2.

The winner will hold the Cup for one year subject to a guarantee of its return in good condition, or, failing this, to refund to the R.H.S. the sum of £25. An Exhibitor may only win the Cup once in three years, but the winner may compete the following year, and if adjudged first in these two successive years will receive a smaller commemorative cup.

1. Hon. Vicary Gibbs, Aldenham House, Aldenham, Herts (gr. E. Beckett).
2. H. T. Tatham, Esq., Kendall Hall, Elstree, Herts (gr. W. Gaiger).
3. No third.
4. Mr. F. Barber, Crooks Cottage, Eynsford, Dartford.

Class 2.—9 kinds distinct to be selected from the list in Class 1. Number of specimens as stated.

The object of this Class is to illustrate vegetables which are in daily use and possess the qualities most valued for table use by cooks.

First Prize, £5; Second, £3; Third, £2; Fourth, £1.

1. W. H. Myers, Esq., Swanmore Park, Bishops Waltham (gr. G. Ellwood).
2. Col. Cox, Harefield Place, Uxbridge (gr. J. Orton).
3. Mr. R. Staward, Panshanger Gardens, Hertford.
4. Rev. L. C. Chalmers-Hunt, Willian Rectory, Hitchin, Herts.

Class 3.—6 kinds distinct to be selected from the list in Class 1. Number of specimens as stated.

First Prize, £3; Second, £2 5*s.*; Third, £1 10*s.*; Fourth, 15*s.*

1. Brodie Henderson, Esq., Epping House, Little Berkhamsted (gr. H. Smith).
2. J. Kerr, Esq., Loudwater, Rickmansworth (gr. T. Avery).
3. Miss E. Bradshaw, The Grange, Steeple Aston.
4. Mr. H. Keep, Aldermaston, Reading.

Class 4.—Potatos.—Collection of 12 varieties distinct.

First Prize, £3; Second, £2; Third, £1.

1. R. McMurdie, Esq., Woburn Park, Weybridge (gr. A. Basile).
2. Mrs. E. H. Denison, Little Gaddesden, Berkhamsted (gr. A. G. Gentle).
3. Sir Montagu Turner, Bedfords, Havering, Romford (gr. A. Humphrey).

Class 5.—Potatos.—Collection of 6 varieties distinct.

First Prize, £1 10*s.*; Second, £1; Third, 10*s.*

Competitors in Class 4 cannot enter in Class 5.

1. H. W. Henderson, Esq., Serge Hill, Kings Langley (gr. F. L. Pike).
2. H. T. Tatham, Esq.
3. Hon. Vicary Gibbs.

Class 6.—Onions.—Collection of 6 varieties distinct.

N.B.—It is imperative that each dish be of a distinct type or character, *e.g.* two strains of 'Ailsa Craig' or two dishes of varieties indistinguishable from 'Ailsa Craig' will disqualify.

First Prize, £2; Second, £1; Third, 10*s.*

1. W. H. Myers, Esq.
2. Hon. Vicary Gibbs.
3. Mr. R. Staward.

Class 7.—Salads.—Collection of 9 kinds distinct, each kind to be staged separately.

First Prize, £3 10*s.*; Second, £2 10*s.*; Third, £1 5*s.*

1. Hon. Vicary Gibbs.
2. H. T. Tatham, Esq.
3. Mr. R. Staward.

Class 8.—Salads.—Collection of 6 kinds distinct, each kind to be staged separately.

First Prize, £2 5*s.*; Second, £1 10*s.*; Third, 15*s.*

Competitors in Class 7 cannot enter in Class 8.

1. W. H. Myers, Esq.
2. Brodie Henderson, Esq.
3. Rev. L. C. Chalmers-Hunt.

Class 9.—Other vegetables.—6 kinds distinct, to be selected from the following:—Cardoons, Capsicum or Chili, Celeriac, Stachys tuberifera, Seakale, Egg Plant, Jerusalem Artichokes, Salsify, Scorzonera, Kohl Rabi, Couve Tronchuda.

First Prize, £2 10*s.*; Second, £1 10*s.*; Third, 15*s.*

1. Hon. Vicary Gibbs.
2. W. H. Myers, Esq.
3. No third.

Single Dish Classes.

In Classes 10-42 the First Prize is in each case 10*s*., the Second 7*s*. 6*d*., Third 5*s*. The specimens shown in each Class must be always of one and the same variety.

Class 10.—Beans—Scarlet Runners.
1. W. H. Myers, Esq.
2. Mr. H. Keep.
3. Hon. Vicary Gibbs.

Class 11.—Beans—French Climbers.
1. Lord Foley, Ruxley Lodge, Claygate (gr. H. C. Gardner).
2. Hon. Vicary Gibbs.
3. Mr. R. Staward.

Class 12.—Beans—French Dwarf.
1. H. T. Tatham, Esq.
2. Hon. Vicary Gibbs.
3. Mr. R. Staward.

Class 13.—Beet—any one type.
1. H. T. Tatham, Esq.
2. Mr. R. Staward.
3. Hon. Vicary Gibbs.

Class 14.—Brussels Sprouts—50 buttons.
1. Hon. Vicary Gibbs.
2. H. W. Henderson, Esq.
3. A. Walker, Esq., Merstham House, Merstham (gr. G. Duncan).

Class 15.—Brussels Sprouts, 3 plants.
1. J. Kerr, Esq.
2. Hon. Vicary Gibbs.
3. Mr. R. Staward.

Class 16.—Cabbage.
1. Lord Foley.
2. Hon. Vicary Gibbs.
3. Earl of Lytton, Knebworth House, Herts (gr. H. Brotherston).

Class 17.—Cabbage—Savoy.
1. Mrs. E. H. Denison.
2. Col. Cox.
3. Lord Foley.

Class 18.—Cauliflower or Broccoli.
1. Hon. Vicary Gibbs.
2. Brodie Henderson, Esq.
3. R. McMurdie, Esq.

Class 19.—Celeriac.
1. R. McMurdie, Esq.
2. Hon. Vicary Gibbs.
3. No third.

Class 20.—Celery, White.
1. R. McMurdie, Esq.
2. Hon. Vicary Gibbs.
3. Mrs. L. Davis, Brynderwin, Hindhead, Haslemere (gr. W. H. Masters).

Class 21.—Celery, Red.
1. Hon. Vicary Gibbs.
2. R. McMurdie, Esq.
3. Brodie Henderson, Esq.

Class 22.—Cucumbers.
1. Miss E. Bradshaw.
2. W. H. Myers, Esq.
3. Lord North, Wroxton Abbey, Banbury (gr. E. R. Janes)

Class 23.—Leeks.
1. W. H. Myers, Esq.
2. Hon. Vicary Gibbs.
3. Mr. R. Staward.

Class 24.—Marrows.
1. Hon. Vicary Gibbs.
2. W. H. Myers, Esq.
3. Mr. R. Staward.

Class 25.—Mushrooms.
1. Hon. Vicary Gibbs.
2., 3. No other award.

Class 26.—Onions, Round or Globular.
1. J. Kerr, Esq.
2. Mr. R. Staward.
3. A. Walker, Esq.

Class 27.—Onions, Flat.
1. H. T. Tatham, Esq.
2. Mr. R. Staward.
3. Hon. Vicary Gibbs.

Class 28.—Parsnips.
1. Hon. Vicary Gibbs.
2. H. T. Tatham, Esq.
3. Lord North.

Class 29.—Carrots, Long.
1. Mrs. E. H. Denison.
2. Hon. Vicary Gibbs.
3. Mr. R. Staward.

Class 30.—Carrots, Stump-rooted or Short.
1. Mrs. E. H. Denison.
2. J. Kerr, Esq.
3. Mr. R. Staward.

Class 31.—Peas.
1. Brodie Henderson, Esq.
2. Mrs. L. Davis.
3. Hon. Vicary Gibbs.

Class 32.—Turnips, White Skin and Flesh.
1. Mrs. E. H. Denison.
2. Hon. Vicary Gibbs.
3. Mr. H. Keep.

Class 33.—Turnips, Parti-coloured.
1. Mrs. E. H. Denison.
2. J. Kerr, Esq.
3. Mr. H. Keep.

Class 34.—Turnips, Yellow Flesh.
1. Hon. Vicary Gibbs.
2. Mr. R. Staward.
3. Brodie Henderson, Esq.

Class 35.—Potatos, White.
1. Miss E. Bradshaw.
2. Mrs. E. H. Denison.
3. R. McMurdie, Esq.

Class 36.—Potatos, Coloured.
1. Hon. Vicary Gibbs.
2. W. H. Myers, Esq.
3. Lord North.

Class 37.—Kale, Dwarf.
1. Hon. Vicary Gibbs.
2. H. W. Henderson, Esq.
3. H. T. Tatham, Esq.

Class 38.—Kale, Tall.
1. Hon. Vicary Gibbs.
2. Mr. R. Staward.
3. H. T. Tatham, Esq.

Class 39.—Tomatos, Red.
1. W. H. Myers, Esq.
2. Lord North.
3. Hon. Vicary Gibbs.

Class 40.—Tomatos, Yellow.
1. Hon. Vicary Gibbs.
No other award.

Class 41.—Tomatos, Ornamental.
1. Colonel Cox.
2. Brodie Henderson, Esq.
3. Hon. Vicary Gibbs.

Class 42.—Any other Vegetable not named in the Schedule.
1. R. McMurdie, Esq.
2. Mr. R. Staward.
3. Hon. Vicary Gibbs.

Champion Challenge Cup.

A Champion Cup will be held for one year (subject to a guarantee of its return in good condition) by the winner of the greatest number of First Prize points throughout the whole Exhibition, the winner in Class 1 being excluded. An Exhibitor may win this cup only once in three years, but the winner may compete the following year, and if adjudged first in these two successive years will receive a smaller commemorative Cup. In calculating for this Champion Cup the number of points reckoned for each First Prize will be as follows :—

Class 2	... 9 Points each.
Classes 3, 4, 7	... 6 ,, ,,
Classes 5, 6, 8, 9	... 4 ,, ,,
All other Classes	... 1 Point ,,

In case of an equality (and only in that case) Second Prizes will be counted, in order to arrive at a decision, each Second Prize counting half the points allotted to the First Prize.

Hon. Vicary Gibbs ... ... 21 points.

GENERAL MEETING.

October 8, 1912.

Dr. A. B. Rendle, F.R.S., in the Chair.

Fellows elected (31).—Miss L. B. Ashford, W. P. Callear, Mrs. Crawley, Mrs. S. de la Rue, Mrs. de Rougemont, G. Lawrence Dunn, H. H. Gribble, Mrs. G. B. Hamilton, Dr. G. C. Hancock, Cyril Harding, Mrs. F. W. Hayne, Wyndham Hull, T. D. Johns, Miss Liversage, R. H. Mardon, E. C. Meysey-Thompson, M.P., E. L. Miskin, H. W. Moffatt, Miss E. R. More, W. T. Morrell, E. S. Neal, E. Parkinson, R. Pound, Miss G. A. Samson, T. Scott, F. W. Smith, J. Steele, E. H. Thompson, Miss F. E. Walter, W. W. Weyer, Miss A. M. Wigram.

Fellows resident abroad (3).—F. E. Buck (Canada), J. Cocks (Canada), H. J. Hume (U.S.A.).

Associates (4).—Miss E. M. d'O. Lees, Miss M. Reece, Miss O. E. Spencer, Miss K. Stowell.

A lecture on "The Influence of Atmospheric Impurities on Vegetation" was given by Dr. Charles Crowther. (See p. 461.)

EIGHTEENTH ANNUAL EXHIBITION OF BRITISH-GROWN FRUIT.

Held at the Society's Hall, Vincent Square, S.W., October 10 and 11, 1912.

THE JUDGES.

Allan, A. R., Hillingdon Court Gardens, Uxbridge.
Allan, W., Gunton Park Gardens, Norwich.
Arnold, T., Cirencester Park Gardens, Gloucester.
Bacon, W. H., Mote Park Gardens, Maidstone.
Barnes, N. F., Eaton Gardens, Chester.
Barnes, W., Hollydene Nurseries, Yateley, Hants.
Basham, J., Bassaleg, Newport, Mon.
Bates, W., Cross Deep Gardens, Twickenham.
Beckett, E., V.M.H., Aldenham House Gardens, Herts.
Bowerman, J., Southcote Manor Gardens, Reading.
Challis, T., V.M.H., Wilton House Gardens, Salisbury.
Cheal, J., Crawley, Sussex.
Coomber, T., V.M.H., The Hendre Gardens, Monmouth.
Crouch, C., St. Anne's Hill Gardens, Chertsey.
Crump, W., V.M.H., Madresfield Court Gardens, Malvern.
Davis, J., Glebelands Gardens, South Woodford.
Divers, W. H., Belvoir Castle Gardens, Grantham.
Doe, J., Rufford Abbey Gardens, Ollerton, Notts.
Earp, W., Bayham Abbey Gardens, Lamberhurst.
Fielder, C. R., V.M.H., The Gardens, Great Warley, Essex.
Gibson, J., Welbeck Abbey Gardens, Worksop.
Goodacre, J. H., V.M.H., Elvaston Castle Gardens, Derby.
Grubb, A., Porters Park Gardens, Shenley, Herts.
Jaques, J., Grey Friars, Chorley Wood, Herts.
Mackellar, A., V.M.H., Royal Gardens, Windsor.
Markham, H., Wrotham Park Gardens, High Barnet.
Molyneux, E., V.M.H., Swanmore Park Gardens, Bishops Waltham.
Mortimer, S., Rowledge, Farnham, Surrey.
Paul, G., J.P., V.M.H., Cheshunt, Herts.
Pearson, A. H., V.M.H., The Hut, Lowdham, Notts.
Pope, W., Welford Park Gardens, Newbury, Berks.
Poupart, W., Marsh Farm, Twickenham.
Reynolds, G., Gunnersbury Park Gardens, Acton, W.

Rivers, H. S., Sawbridgeworth.
Ross, C., V.M.H., Cedar House, Barford, Warwick.
Salter, C. J., Normanhurst Gardens, Rusper, Horsham
Smith, A. C., R.H.S. Gardens, Wisley, Ripley, Surrey.
Smith, J. R., Bedgebury Park Gardens, Goudhurst, Kent.
Turton, T., Sherborne Castle Gardens, Dorset.
Veitch, P. C. M., J.P., New North Road, Exeter.
Vert, J., Audley End Gardens, Saffron Walden.
Ward, A., Godinton Gardens, Ashford, Kent.
Weston, J. G., Eastwell Park Gardens, Ashford, Kent.
Whittle, J., Cheveney Gardens, Hunton, Maidstone.
Williams, H. H., Pencalenick, Truro.
Woodward, G., Barham Court Gardens, Teston, Maidstone.
Wythes, G., V.M.H., Maryville, Chart Road, Folkestone.

THE REFEREES.

Bunyard, G., V.M.H., Royal Nurseries, Maidstone.
Metcalfe, A. W., Luton Hoo Gardens, Beds.
Pearson, A. H., V.M.H., The Hut, Lowdham, Notts.
Thomas, O., V.M.H., 25 Waldeck Road, West Ealing.

OFFICIAL PRIZE LIST.

The Owner's name and address and the Gardener's name are entered on the first occurrence, but afterwards only the Owner's name is recorded.

Division I.

Fruits grown under Glass or otherwise.

Open to Gardeners and Amateurs only.

Note.—Exhibitors can compete in one Class only of Classes 1, 2, and of Classes 3, 4.

Class 1.—Collection of 9 dishes of Ripe Dessert Fruit:—6 kinds at least; only 1 Pine, 1 Melon, 1 Black and 1 White Grape allowed; not more than 2 varieties of any other kind, and no two dishes of the same variety.

First Prize, Silver Cup and £5; Second, £5; Third, £3.

1. Lady Henry Somerset, Eastnor Castle, Ledbury (gr. G. Mullins).
2. C. A. Cain, Esq., The Node, Welwyn (gr. T. Pateman).

Extra. Earl of Harrington, Elvaston Castle, Derby (gr. J. H. Goodacre).

Extra. Duke of Newcastle, Clumber, Worksop (gr. S. Barker).

Class 2.—Collection of 6 dishes of Ripe Dessert Fruit:—4 kinds at least; only 1 Melon, 1 Black and 1 White Grape allowed; not more than 2 varieties of any other kind and no 2 dishes of the same variety. Pines excluded.

First Prize, Silver Cup and £3; Second, £3; Third, £2.

1. Lord Belper, Kingston Hall, Derby (gr. W. H. Cooke).
2. Lord Hillingdon, Wildernesse, Sevenoaks (gr. J. Shelton).
3. Lord Howard de Walden, Audley End, Saffron Walden (gr. J. Vert).

Class 3.—Grapes, 5 distinct varieties (2 bunches of each), of which 2 at least must be White.

First Prize, Silver Cup and £4; Second, £4; Third, £2.

1. Duke of Newcastle.
2. Earl of Harrington.
3. C. Bayer, Esq., Tewkesbury Lodge, Forest Hill (gr. E. C Wickens).

Class 4.—Grapes, 4 varieties, selected from the following: 'Madresfield Court,' 'Mrs. Pince,' 'Muscat Hamburgh,' 'Muscat of Alexandria' or 'Canon Hall' (not both), 'Mrs. Pearson,' and 'Dr. Hogg,' 2 bunches of each.

First Prize, Silver Cup and £3; Second, £3.

1. Lord Hillingdon, Sevenoaks.
2. H. St. Maur, Esq., Stover Park, Newton Abbot (gr. G Richardson).

Class 5.—Grapes, Black Hamburgh, 2 bunches.

First Prize, £1 10*s.*; Second, £1; Third, 10*s.*

1. Rev. W. Beecher, Wellow Hall, Newark (gr. A. Heald).
2. Duke of Newcastle.
3. Earl of Harrington.

Class 6.—Grapes, Mrs. Pince, 2 bunches.

First Prize, £1 10*s.*; Second, £1.

1. H. St. Maur, Esq.
2. G. Miller, Esq., Newberries, Radlett (gr. J. Kidd).

Class 7.—Grapes, Alicante, 2 bunches.

First Prize, £1 10*s.*; Second, £1; Third, 10*s.*

1. Mrs. W. G. Raphael, Castle Hill, Englefield Green (gr. H. Brown).
2. Lady Henry Somerset.
3. Lady Tate, Park Hill, Streatham Common (gr. W. Howe).

Class 8.—Grapes, Madresfield Court, 2 bunches.

First Prize, £1 10*s.*; Second, £1; Third, 10*s.*

1. Earl of Harrington.
2. Lord Savile, Rufford Abbey, Ollerton (gr. J. Doe).
3. Duke of Newcastle.

Class 9.—Grapes, Prince of Wales, 2 bunches.

First Prize, £1 10*s.*; Second, £1.

1. Lord Savile.
2. H. H. König, Esq., Ardenrun Place, Redhill (gr. H. J. Alderman).

Class 10.—Grapes, any other Black Grape, 2 bunches.
First Prize, £1 10*s.*; Second, £1.

1. J. Liddell, Esq., Sherfield Manor, Basingstoke (gr. R. Learmouth).
2. Mrs. W. G. Raphael.

Class 11.—Grapes, Muscat of Alexandria, 2 bunches.
First Prize, £2; Second, 25*s.*; Third, 15*s.*

1. W. W. Mann, Esq., Ravenswood, Bexley (gr. J. Simon).
2. Lord Hillingdon, Hillingdon Court, Uxbridge (gr. A. R. Allan).
3. Lady Henry Somerset.

Class 12.—Grapes, any other White Grape, 2 bunches.
First Prize, £1 10*s.*; Second, £1; Third, 10*s.*

1. C. A. Cain, Esq.
2. W. B. M. Bird, Esq., Eartham House, Chichester (gr. A. Gooding).
3. C. Bayer, Esq.

Class 13.—Collection of Hardy Fruits, in a space not exceeding 12′ × 3′. 30 dishes distinct, grown entirely in the open; not more than 12 varieties of Apples or 8 of Pears.

First Prize, The Hogg Medal and £3; Second, £2; Third, £1.

1. Sir Marcus Samuel, Bt., Mote Park, Maidstone (gr. W. H. Bacon).

No other award.

Division II.

Open to Nurserymen only.

Nurserymen and Market Growers must exhibit as individuals or as firms. *They must have actually grown all they exhibit.* Combinations of individuals or firms are not allowed, nor the collection of produce from different districts.

Nurserymen and Market Growers desiring to exhibit at this Show must make application for space as under Class 14 or 15 or 16 or 17; 18, 19; 20 or 21 or 22. No other spaces but the above can be allotted. Exhibitors can only enter in one of Classes 14 to 17; or in one of 20, 21 and 22.

Nurserymen and Market Growers may adopt any method of staging and number of fruits to a dish they desire. The use of berries and foliage plants is allowed for decoration but not flowers.

For Fruit grown entirely out of doors.

Class 14.—30 feet run of 6 feet tabling.

Messrs. G. Bunyard, Maidstone: Gold Medal.
Messrs. Cannell, Swanley: Silver-gilt Knightian Medal.
Messrs. J. Cheal, Crawley: Silver-gilt Knightian Medal.

Class 15.—20 feet run of 6 feet tabling.

Mr. R. C. Notcutt, Woodbridge: Gold Medal.
Barnham Nurseries, Sussex: Silver-gilt Knightian Medal.
Messrs. S. Spooner, Hounslow: Silver-gilt Knightian Medal.
Messrs. Laxton, Bedford: Silver Knightian Medal.
Messrs. W. Seabrook, Chelmsford: Silver Knightian Medal.

Class 16.—12 feet run of 6 feet tabling.

Mr. C. Turner, Slough: Silver-gilt Knightian Medal.
Messrs. G. Cooling, Bath: Silver-gilt Banksian Medal.
Messrs. J. Peed, Morden: Silver Knightian Medal.
Messrs. Paul, Cheshunt: Silver Banksian Medal.

Class 17.—6 feet run of 6 feet tabling.

No entries.

For Orchard House Fruit and Trees.

Class 18.—24 feet by 6 feet of stage. Grapes excluded.

Messrs. T. Rivers, Sawbridgeworth: Gold Medal.
King's Acre Nurseries, Hereford: Silver-gilt Banksian Medal.

Class 19.—9 Vines, growing in pots, not less than three varieties.

Messrs. T. Rivers, Sawbridgeworth: Silver Knightian Medal.

Division III.

Open to Market Growers only.

Class 20.—Apples, 20 baskets of (Cooking and Dessert, distinct).

Messrs. Gaskain & Whiting, Faversham: Gold Medal.
Hollesley Bay Labour Colony, Suffolk: Silver-gilt Banksian Medal.

Class 21.—Apples, 12 baskets of (6 Cooking and 6 Dessert, distinct).

Mr. A. E. Mason, Hampton Hill: Fruiterers' Company's Silver-gilt Medal.
Mr. H. Lumley Webb, Sittingbourne: Silver Knightian Medal.

Class 22.—Pears, 6 baskets of, distinct.

No entries.

Division IV.

Fruits grown entirely in the open air.

Open to Gardeners and Amateurs only.
Nurserymen and Market Growers excluded.

Exhibitors of Apples or Pears in Division IV. are excluded from Division VI.

Note.—Exhibitors can compete in one Class only of the Classes 23, 24, 25; or 28, 29, 30, 31.

Class 23.—Apples, 24 dishes distinct, 16 Cooking, 8 Dessert. The latter to be placed in the front row.

First Prize, a Hogg Medal and £5; Second, £3; Third, £2.

1. C. A. Cain, Esq.
2. Sir Marcus Samuel, Bt.

No third.

Class 24.—Apples, 18 dishes distinct, 12 Cooking, 6 Dessert. The latter to be placed in the front row.

First Prize, £3; Second, £2; Third, £1.

1. J. G. Williams, Esq., Pendley Manor, Tring (gr. F. G. Gerrish).

No other awards.

Class 25.—Apples, 12 dishes distinct, 8 Cooking, 4 Dessert. The latter to be placed in the front row.

First Prize, £2; Second, £1; Third, 15*s*.

1. J. Liddell, Esq.

No other awards.

Class 26.—Cooking Apples, 6 dishes distinct.

First Prize, £1; Second, 15*s*.

1. C. A. Cain, Esq.
2. Lady Henry Somerset.

Class 27.—Dessert Pears, 6 dishes distinct.

First Prize, £1; Second, 15*s*.

1. Lady Henry Somerset.
2. Sir Marcus Samuel, Bt.

Class 28.—Dessert Pears, 18 dishes distinct.

First Prize, a Hogg Medal and £2; Second, £2; Third, £1.

1. Col. B. J. Petre, Westwick, Norwich (gr. G. D. Davison).
2. C. A. Cain, Esq.
3. R. Liddell, Esq.

Class 29.—Dessert Pears, 12 dishes distinct.

First Prize, £2; Second, £1; Third, 15*s*.

No entries.

Class 30.—Dessert Pears, 9 dishes distinct.

First Prize, £1 10*s*.; Second, 17*s*. 6*d*.

No first.

2. A. P. Brandt, Esq., Bletchingley Castle, Surrey (gr. J. W. Barks).

Class 31.—Dessert Pears, 6 dishes distinct.

First Prize, £1; Second, 15*s*.

1. Sir Edmund G. Loder, Bt., Leonardslee, Horsham (gr. W. A. Cook).

No second.

Class 32.—Stewing Pears, 3 dishes distinct.

First Prize, 15*s*.; Second, 10*s*.

1. Col. B. J. Petre.
2. Earl of Devon, Powderham Castle, Exeter (gr. T. H. Bolton).

Extra. Sir Marcus Samuel, Bt.

Class 33.—Plums, 3 Dishes, distinct.

First Prize, £1; Second, 10*s*.

1. Lord Howard de Walden.
2. Mr. J. Hill, Kingston Lacy Gardens, Wimborne.

Class 34.—Damsons, or Bullaces, 3 Dishes, distinct.

First Prize, 10*s*.; Second, 7*s*. 6*d*.

1. J. G. Williams, Esq.
2. Mr. R. Staward, Panshanger Gardens, Hertford.

Class 35.—Morello Cherries, 50 Fruits.

First Prize, 7*s*.; Second, 5*s*.

1. J. G. Williams, Esq.
2. J. B. Fortescue, Esq., Dropmore, Maidenhead (gr. C. Page).

Division V.

Special District County Prizes.

Open to Gardeners and Amateurs only.

(In this Division all fruit must have been grown entirely in the open.)

N.B.—Exhibitors in Division V. must not compete in Divisions II. or III., or in Classes 1, 2, 3, 4, 13, 23, 24, 25, 26, 28, 29, 30.

Class AA.—Apples, 6 Dishes, distinct, 4 Cooking, 2 Dessert.

First Prize, £1 and Third-Class Single Fare from Exhibitor's nearest Railway Station to London; * Second Prize, 15*s*. and Railway Fare as above.*

Class BB.—Dessert Pears, 6 Dishes, distinct.

First Prize, £1 10*s*. and Railway Fare as above;* Second Prize, £1 and Railway Fare as above.*

The two above Classes Nos. AA and BB are repeated eleven times as follows, and Exhibitors must enter for them thus:—"Class AA 36" or "BB 37," and so on, to make it quite clear whether they mean Apples or Pears.

* In the event of the same Exhibitor being successful in both Classes AA and BB only one Railway Fare will be paid; and no Railway Fare will be paid if the fruit is sent up for the Society's officers to unpack and stage.

Class 36.—Open only to Kent Growers.

AA.
1. Captain S. G. Reid, The Elms, Yalding (gr. J. Coleman).
2. W. E. S. Erle Drax, Esq., Olantigh Towers, Wye (gr. J. Bond).

BB.
1. Captain S. G. Reid.
2. W. E. S. Erle Drax, Esq.

Class 37.—Open only to Growers in Surrey, Sussex, Hants, Dorset, Somerset, Devon, and Cornwall.

AA.
1. Duke of Richmond and Gordon, Goodwood, Sussex (gr. F. Brock).
2. J. Copp, Esq., Ferndale, Teignmouth.

BB. 1. F. J. B. Wingfield-Digby, Esq., Sherborne Castle, Dorset (gr. T. Turton).
2. C. H. Combe, Esq., Cobham Park, Surrey (gr. A. Tidy).

Class 38.—Open only to Growers in Wilts, Gloucester, Oxford, Bucks, Berks, Beds, Herts, and Middlesex.

AA. 1. J. B. Fortescue, Esq.
No second.

BB. 1. Lord Hillingdon, Uxbridge.
2. B. E. Richardson, Esq., Hill House, Stanstead Abbotts (gr. E. Colman).

Class 39.—Open only to Growers in Essex, Suffolk, Norfolk, Cambridge, Hunts, and Rutland.

AA. 1. Right Hon. J. W. Lowther, Campsea Ashe, Suffolk (gr. A. Andrews).
2. Sir Montagu Turner, The Bedfords, Havering, Romford (gr. A. Humphrey).

BB. 1. Col. the Hon. C. Harbord, Gunton Park, Norwich (gr. W. Allan).
2. C. H. Berners, Esq., Woolverstone Park, Ipswich (gr. W. Messenger).

Class 40.—Open only to Growers in Lincoln, Northampton, Warwick, Leicester, Notts, Derby, Staffs, Shropshire, and Cheshire.

AA. 1. F. Bibby, Esq., Hardwicke Grange, Shrewsbury (gr. J. Taylor).
2. Sir Oswald Mosley, Rolleston Hall, Burton-on-Trent (gr. H. Collier).

BB. 1 F. Bibby, Esq.
2. Sir Oswald Mosley.

Class 41.—Open only to Growers in Worcester, Hereford, Monmouth, Glamorgan, Carmarthen, and Pembroke.

AA. No. entries.

BB. No first.
2. Mr. W. E. Hyde, Old Post Office, Trumpet, Ledbury, Hereford.

Class 42.—Open only to Growers in the other Counties of Wales.
No entries.

Class 43.—Open only to Growers in the six Northern Counties of England, and in the Isle of Man.

AA. 1. Baron de Forest, Londesborough Park, Market Weighton (gr. J. C. McPherson).
2. Mr. W. Chuck, Brodsworth Hall Gardens, Doncaster.

BB. 1. Baron de Forest.
2. Mr. W. Chuck.

Class 44.—Open only to Growers in Scotland.

AA. 1. Col. Gordon, Threave House, Castle Douglas (gr. J. Duff).
2. R. M. Pilkerton, Esq., St. Fort House, Fife (gr. J. J. Staward).

BB. 1. R. M. Pilkerton, Esq.
No entries.

Class 45.—Open only to Growers in Ireland.

AA. 1. Earl of Bessborough, Bessborough, Piltown (gr. T. E. Tomalin).
2. C. B. Broad, Esq., Aghern, Conna, Co. Cork.

BB. No entries.

Class 46.—Open only to Growers in the Channel Islands.
No entries.

Division VI.

Single Dishes of Fruit grown entirely in the open air.

Six Fruits to a Dish.

Open to Gardeners and Amateurs only.
Nurserymen and Market Growers excluded.

All the varieties named in Division VI. are excellent and worthy of general cultivation.

Prizes in each Class, except 72, 73, 104, 143, and 144, as follows:
First Prize, 7*s.*; Second Prize, 5*s.*

Choice Dessert Apples.

N.B.—The Judges are instructed to prefer quality, colour, and finish to mere size.

[An Exhibitor may show only one Dish in each Class.]

Class 47.—Adams' Pearmain.
1. W. E. S. Erle Drax, Esq.
2. H. St. Maur, Esq.

Class 48.—Allington Pippin.
1. Earl of Westmoreland, Woodstock Park, Sittingbourne (gr. C. Wotton).
2. I. Lewis, Esq., Bedgebury Park, Goudhurst (gr. J. R. Smith).

Class 49.—American Mother.
1. J. B. Fortescue, Esq.
2. Col. R. Bullock, Nuthurst, Godalming.

Class 50.—Belle De Boskoop.
1. H. St. Maur, Esq.
2. C. B. Broad, Esq.

Class 51.—Ben's Red.
1. C. B. Broad, Esq.
2. Rev. H. A. Bull, Wellington House, Westgate-on-Sea (gr. F. King).

Class 52.—Blenheim Orange.
1. C. H. Combe, Esq.
2. C. H. Berners, Esq.

Class 53.—Charles Ross.
1. Rev. H. A. Bull.
2. Right Hon. J. W. Lowther.

Class 54.—Christmas Pearmain.
1. Duke of Richmond and Gordon.
2. Mr. B. J. Mercer, Wierton Place Gardens, Maidstone.

Class 55.—Claygate Pearmain.
No award.

Class 56.—Coronation.
1. Duke of Richmond and Gordon.
2. J. Copp, Esq.

Class 57.—Cox's Orange.
Equal 1. { Duchess of Albany, Claremont, Esher (gr. J. S. Kelly).
Col. the Hon. C. Harbord. }
2. W. E. S. Erle Drax, Esq.

Class 58.—Duke of Devonshire.
1. J. Copp, Esq.
2. W. A. Voss, Esq., Fairlight Glen, Rayleigh, Essex.

Class 59.—Egremont Russet.
1. W. E. S. Erle Drax, Esq.
2. C. H. Berners, Esq.

Class 60.—Houblon.
1. J. Copp, Esq.
2. Mr. J. Hill.

Class 61.—James Grieve.
Equal 1. { J. Copp, Esq.
W. E. S. Erle Drax, Esq. }

Class 62.—King of Tompkins County.
1. Earl of Bessborough.
2. Earl of Westmoreland.

Class 63.—Lord Hindlip.
1. Earl of Bessborough.
2. Capt. S. G. Reid.

Class 64.—Margil.
1. Capt. S. G. Reid.
2. J. B. Fortescue, Esq.

Class 65.—Ribston Pippin.
1. Col. the Hon. C. Harbord.
2. W. Castle, Holland House, Mildenhall (gr. J. Reynolds).

Class 66.—Rival.
1. Duke of Richmond and Gordon.
2. W. E. S. Erle Drax, Esq.

Class 67.—Ross Nonpareil.
No entries.

Class 68.—St. Edmund's Pippin.
1. Col. the Hon. C. Harbord.
No second.

Class 69.—St. Everard.
No entries.

Class 70.—Wealthy.
1. C. H. Berners, Esq.
2. Duke of Richmond and Gordon.

Class 71.—William Crump.
No entries.

Class 72.—8 Fruits of any early variety, not included above, fit for use.

Four Prizes, 7*s*., 6*s*., 5*s*., 4*s*.
1. Viscount Enfield, Wrotham Park, Barnet (gr. H. Markham).
2. W. E. S. Erle Drax, Esq.
3. F. J. B. Wingfield-Digby, Esq.
4. Mr. B. J. Mercer.

Class 73.—8 Fruits of any late variety, not included above.

Four Prizes, 7*s*., 6*s*., 5*s*., 4*s*.
1. Col. the Hon. C. Harbord.
2. Duke of Richmond and Gordon.
3. Marquis of Ripon, Coombe Court, Kingston Hill (gr. T. Smith).
4. Viscount Enfield.

Choice Cooking Apples.

Class 74.—Annie Elizabeth.
1. W. E. S. Erle Drax, Esq.
2. Mr. B. J. Mercer.

Class 75.—Beauty of Kent.
1. R. McMurdie, Esq., Woburn Park, Weybridge (gr. A. Basile).
2. F. W. Platt, Esq., Ken View, Highgate (gr. C. Turner).

Class 76.—Bismarck.
1. Right Hon. J. W. Lowther.
2. Duke of Richmond and Gordon.

Class 77.—Blenheim Orange, large fruits.
1. D. A. Seligman, Esq., Iden Manor, Staplehurst (gr. P. D. Awcock).
2. Lord Howard de Walden.

Class 78.—Bramley's Seedling.
1. Earl of Westmoreland.
2. Capt. S. G. Reid.

Class 79.—Byford Wonder.
1. J. Copp, Esq.
2. J. B. Fortescue, Esq.

Class 80.—Dumelow's Seedling, *syn.* Wellington and Normanton Wonder.
1. Lord Hillingdon, Sevenoaks.
2. W. W. Mann, Esq.

Class 81.—Ecklinville.
1. J. B. Fortescue, Esq.
2. W. E. S. Erle Drax, Esq.

Class 82.—Edward VII.
1. Col. R. Bullock.
No second.

Class 83.—Emneth Early, *syn.* Early Victoria.
No first.
2. I. Lewis, Esq.

Class 84.—Emperor Alexander.
1. H. St. Maur, Esq.
2. Capt. S. G. Reid.

Class 85.—Gascoyne's Scarlet.
1. Lord Howard de Walden.
2. Right Hon. J. W. Lowther.

Class 86.—Golden Noble.
1. W. E. S. Erle Drax, Esq.
2. G. Hanbury, Esq., Blythewood, Maidenhead (gr. C. L. Branson).

Class 87.—Grenadier.
No first.
2. J. B. Fortescue, Esq.

Class 88.—Hambling's Seedling.
1. W. E. S. Erle Drax, Esq.
2. Earl of Bessborough.

Class 89.—Lady Henniker.
1. I. Lewis, Esq.
2. W. E. S. Erle Drax, Esq.

Class 90.—Lane's Prince Albert.
1. Earl of Bessborough.
2. Duke of Richmond and Gordon.

Class 91.—Lord Derby.
1. Capt. S. G. Reid.
2. Duke of Richmond and Gordon.

Class 92.—Mère de Ménage.
1. H. St. Maur, Esq.
2. W. E. S. Erle Drax, Esq.

Class 93.—Newton Wonder.
1. W. E. S. Erle Drax, Esq.
2. Mr. B. J. Mercer.

Class 94.—Norfolk Beauty.
1. Right Hon. J. W. Lowther.
2. J. B. Fortescue, Esq.

Class 95.—Peasgood's Nonesuch.
1. Duke of Richmond and Gordon.
2. W. E. S. Erle Drax, Esq.

Class 96.—Potts' Seedling.
1. Mrs. Austin, Ellern Mede, Totteridge (gr. G. Longhurst).
2. W. B. M. Bird, Esq.

Class 97.—Rev. W. Wilks.
1. Earl of Bessborough.
2. W. E. S. Erle Drax, Esq.

Class 98.—Royal Jubilee.
1. Duke of Richmond and Gordon.
2. F. J. B. Wingfield-Digby, Esq.

Class 99.—Scarlet Victoria.
No Entries.

Class 100.—Stirling Castle.
1. J. B. Fortescue, Esq.
2. H. St. Maur, Esq.

Class 101.—The Queen.

1. Earl of Bessborough.
2. Right Hon. J. W. Lowther.

Class 102.—Tower of Glamis.

1. Mr. B. J. Mercer.
2. Lord Hillingdon, Sevenoaks.

Class 103.—Warner's King.

1. Earl of Westmoreland.
2. Mrs. T. O'Donnell, Tinadilly, Piltown, Ireland.

Class 104.—8 Fruits of any other variety, not included above.

Four prizes, 7*s*., 6*s*., 5*s*., 4*s*.

1. Earl of Bessborough.
2. Right Hon. J. W. Lowther.
3. W. E. S. Erle Drax, Esq.
4. Capt. S. G. Reid.

Choice Dessert Pears.

Class 105.—Beurré Alexander Lucas.

1. F. J. B. Wingfield-Digby, Esq.
2. Earl of Westmoreland.

Class 106.—Beurré D'Amanlis.

No first.
2. Mrs. Austin.

Class 107.—Beurré D'Anjou.

1. J. B. Fortescue, Esq.
2. C. H. Berners, Esq.

Class 108.—Beurré D'Avalon, *syn.* Porch's Beurré and Glastonbury.

No entries.

Class 109.—Beurré Bosc.

1. F. J. B. Wingfield-Digby, Esq.
2. Right Hon. J. W. Lowther.

Class 110.—Beurré de Naghan.

No entries.

Class 111.—Beurré Dumont.

1. R. McMurdie, Esq.
2. Lord Hillingdon, Sevenoaks.

Class 112.—Beurré Hardy.

1. R. McMurdie, Esq.
2. Captain S. G. Reid.

Class 113.—Beurré Perran.

1. F. J. B. Wingfield-Digby, Esq.
No second.

Class 114.—Beurré Superfin.
1. E. G. Mocatta, Esq., Woburn Place, Addlestone (gr. T. Stevenson).
2. R. McMurdie, Esq.

Class 115.—Blickling.
1. Col. the Hon. C. Harbord.
No second.

Class 116.—Charles Ernest.
1. F. J. B. Wingfield-Digby, Esq.
2. R. McMurdie, Esq.

Class 117.—Comte de Lamy.
1. Lord Hillingdon, Uxbridge.
2. Lord Hillingdon, Sevenoaks.

Class 118.—Conference.
1. F. J. B. Wingfield-Digby, Esq.
2. Earl of Westmoreland.

Class 119.—Directeur Hardy.
No entries.

Class 120.—Doyenné du Comice.
1. F. J. B. Wingfield-Digby, Esq.
2. Col. the Hon. C. Harbord.

Class 121.—Durondeau.
1. F. J. B. Wingfield-Digby, Esq.
2. R. McMurdie, Esq.

Class 122.—Easter Beurré.
1. Lord Hillingdon, Uxbridge.
2. Mr. J. Hill.

Class 123.—Emile D'Heyst.
1. F. J. B. Wingfield-Digby, Esq.
2. Duke of Newcastle.

Class 124.—Fondante d'Automne.
1. R. McMurdie, Esq.
2. Col. the Hon. C. Harbord.

Class 125.—Fondante de Thiriot.
1. C. H. Berners, Esq.
2. Col. R. Bullock.

Class 126.—Glou Morceau.
1. B. E. Richardson, Esq.
2. R. McMurdie, Esq.

Class 127.—Gratioli of Jersey.
1. Mrs. M. P. Mead, St. Mary's, Teddington.
2. Rev. H. A. Bull.

Class 128.—Joséphine de Malines.
1. F. J. B. Wingfield-Digby, Esq.
2. Col. the Hon. C. Harbord.

Class 129.—Le Brun.
1. R. McMurdie, Esq.
2. Capt. S. G. Reid.

Class 130.—Le Lectier.
1. Lord Howard de Walden.
2. Capt. S. G. Reid.

Class 131.—Louise Bonne of Jersey.
1. F. Bibby, Esq.
2. Lady Tate.

Class 132.—Marie Benoist.
1. F. J. B. Wingfield-Digby, Esq.
2. Lord Foley, Ruxley Lodge, Claygate (gr. H. C. Gardner).

Class 133.—Marie Louise.
1. I. Lewis, Esq.
2. R. McMurdie, Esq.

Class 134.—Nouvelle Fulvie.
1. F. J. B. Wingfield-Digby, Esq.
2. B. E. Richardson, Esq.

Class 135.—Olivier des Serres.
1. Lord Hillingdon, Uxbridge.
2. Lord Hillingdon, Sevenoaks.

Class 136.—Pitmaston Duchess.
1. Rev. H. A. Bull.
2. Mr. M. Fraser, Brimley, Teignmouth.

Class 137.—President Barabé.
1. Col. The Hon. C. Harbord.
2. F. J. B. Wingfield-Digby, Esq.

Class 138.—Santa Claus.
No entries.

Class 139.—Souvenir du Congrès.
1. R. McMurdie, Esq.
2. J. B. Fortescue, Esq.

Class 140.—Thompson.
1. Lord Hillingdon, Uxbridge.
2. E. G. Mocatta, Esq.

Class 141.—Triomphe de Vienne.

1. Lord Hillingdon, Sevenoaks.

No second.

Class 142.—Winter Nélis.

1. Lord Foley.
2. J. B. Fortescue, Esq.

Class 143.—8 Fruits of any early variety, not included above.

Four Prizes, 7*s*., 6*s*., 5*s*., 4*s*.

1. R. McMurdie, Esq.
2. Mr. B. J. Mercer.
3. Capt. S. G. Reid.
4. B. E. Richardson, Esq.

Class 144.—8 Fruits of any late variety, not included above.

Four Prizes, 7*s*., 6*s*., 5*s*., 4*s*.

1. F. J. B. Wingfield-Digby, Esq.
2. R. McMurdie, Esq.
3. Duke of Richmond and Gordon.
4. Lord Foley.

Fruit Competition for Affiliated Societies.

Apples and Pears.

Six Dishes, distinct, Cooking Apples; Six Dishes, distinct, Dessert Apples; Six Dishes, distinct, Dessert Pears. Six Fruits to each Dish.

Affiliated Societies.—It is stipulated that no two Societies may combine, and that each Society competing collects all the specimens shown from amongst their own members only and not from outside. Eight days' notice must be given of intention to compete.

The Cup may be won only once in three years by any one Society; but the winners may compete for any other prizes offered in this Class.

If the same Society which won the Challenge Cup in 1911 again exhibits and is considered by the Judges to be 1st, thus again establishing the excellence of such Society's exhibit, a smaller Silver Cup will be awarded by the Council instead of the Medal offered as the 2nd Prize; and similarly in future years a winning Society must win again in the immediately following year in order to establish a claim for the smaller Cup in place of the Silver-gilt Knightian Medal.

Challenge Cup and Silver-gilt Knightian Medal: Colchester and District Gardeners' Association.

Sec., W. H. Tanner, 43 East Street, Colchester.

Silver Cup: Ipswich and District Gardeners' Association.

Sec., F. W. Salmon, 65 Brooks Hall Road, Ipswich.

Silver-gilt Banksian Medal: East Anglian Horticultural Society.

Sec., W. L. Wallis, Royal Arcade, Norwich.

REPORT OF THE ANNUAL CONFERENCE OF AFFILIATED SOCIETIES AND OF THE UNION OF MUTUAL IMPROVEMENT SOCIETIES.

October 11, 1912.

Sir Daniel Morris, K.C.M.G., V.M.H., in the Chair.

The Chairman welcomed the 124 delegates in the name of the Council, and expressed the Secretary's regret that he was unable to be present; whereupon the delegates requested that their appreciation be conveyed to him for the work done for the R.H.S. and kindred societies in the past, and their hope that he would long be able to continue his valuable services to horticulture.

Sir Daniel called attention to the new series of printed lectures drawn up for the use of affiliated societies. These were as follows: (1) Knowledge and Work in Gardening; (2) Tuberous-rooted Crops, mainly Potatos; (3) Tap- and Bulbous-rooted Crops; (4) Hearting, Leaf, and Salad Vegetables; (5) Stem-crop Vegetables, Herbs, &c.; (6) Pod-bearing and Edible-fruited Crops; (7) Fruit for Cottagers; (8) Plants and Flowers for Cottagers; (9) The Flora of the Chatham Islands, by Captain A. Dorrien-Smith; (10) Plants for a Warm Corner, by Mr. R. I. Lynch, M.A. Nos. 9 and 10 have accompanying lantern slides.

Attention was also drawn to the sets of printed cards for use at shows held under the auspices of affiliated societies, indicating points of excellence in exhibits of vegetables, the intention being that the cards should be put up conspicuously at every show amongst the exhibits referred to, so that visitors, instead of viewing exhibits with little or no idea of what constitutes excellence, will have before them the "points" from a judge's standard. Thus they will see for themselves where an exhibit has succeeded or failed, and in what direction their own efforts should be turned if they are to become prize-winners. These cards are issued at 1*s*. 6*d*. the set of 25.

It was hoped that the offer of a silver cup for exhibits by affiliated societies, consisting of groups of hardy herbaceous flowers, at the Summer Shows at Holland Park would bring forward keen competition. Full particulars are to be found in the R.H.S. "Book of Arrangements" for 1912, page 68.

The following results of the 1912 Competition for the Affiliated Societies' Challenge Cup for Apples and Pears were announced:—

First: Ipswich and District Society. Having won the cup in 1911, under the regulations a smaller cup was awarded.

Second: East Anglian Society. Having won the cup in 1910, under the regulations the Society was ineligible for the Challenge Cup, and was awarded the 2nd Prize (Silver-gilt Banksian Medal).

Third: Colchester Society. Awarded the Affiliated Societies' Cup.

Mr. G. G. Hamilton, F.R.C.S., Hon. Secretary and delegate from the Bournemouth Horticultural Society, then gave an exhibition of his remarkable series of photographs in colour of gardens and plants in the neighbourhood of Bournemouth and the New Forest. These were greatly appreciated. A cordial vote of thanks was passed to Mr. Hamilton.

The next item on the Agenda—viz., "How to Attract Young Men to Attend Meetings of Mutual Improvement Societies"—produced an interesting discussion. The general idea was that the many counter-attractions, in towns and cities especially, were an opposing influence to attendance at such meetings. Nevertheless, a great many societies had an appreciable number of young men attached to them who were kept interested by being invited to take an active part in the proceedings. Papers were read by them, and prizes awarded according to merit; they were encouraged to express their opinions on subjects discussed; gardening literature was available for their reading; head gardeners did their best to interest young men and to benefit them by imparting information; and generally their identification with the aims and objects of the Society was steadily kept in view. The subscriptions for the younger men were stated to range from 1*s.* to 2*s.* 6*d.* per annum.

The Chairman suggested that wherever public and village libraries existed they might be asked to provide a few standard horticultural works for reference, and that in country places small horticultural libraries might be gradually formed.

It was stated that the Croydon Mutual Improvement Society was accustomed to borrow books from the public library on the subject of an evening's lecture for the reference of members on such occasions, and frequently collections of horticultural books were brought together and inspected by members. By such means it was thought the value of mutual improvement societies would be more highly appreciated by young gardeners.

Mr. Bullen read a short paper on the difficulties met with by the Guildford Society in the matter of admitting women gardeners to membership. The opinion of the Conference was that each society should decide for itself the best course to pursue in the matter.

Mr. Jay briefly recounted what the Garden Club of the St. Barnabas, Sutton, Society was doing, and invited information from other districts. He said that the object of the club was to help allotment-holders and others cultivating land to procure manure, seeds, and garden requisites as easily as possible and on the best terms. His society had, three months ago, started a club called the Seed, Manure, and Deposit Club. Members have only to pay 2*d.* for their entrance fee and card of membership, which contains the rules of the club, &c., and spaces in which the amounts deposited and withdrawn are entered. The Secretary of the club, with assistants, collects any money (frequently quite a few pence) the members may have to spare when they get their pay, enters the amount deposited on their cards and in his

book, and pays in what is collected each week to the Treasurer, who, in turn, pays the money into the P. O. Savings Bank in the names of two trustees. The men are getting plenty of vegetables, &c., from their ground, and can spare fairly willingly a few pence weekly to place in the club funds; and when the time comes for putting manure on the land and ordering seeds, paying rent, buying bean or pea sticks, &c., they have the money ready to be withdrawn for such purposes. Beyond making it easier for them to feed their land properly, and get good seeds and better terms by being able to give larger orders, they also hope to get their goods at reduced prices. It is proving a good and useful movement, having considerably increased the membership and attendance at the meetings.

Mr. Jay hopes to be able to tell the delegates at the 1913 Conference how the first year's attempt has answered.

The desirability of forming a small loan fund was suggested as a possible means of extending the value of the Garden Club described by Mr. Jay.

The invitation for rules for the judging of bottled fruits produced the following suggestions, which are given as sent in, but have not been in any way revised or authorized by the R.H.S.:—

From the Croydon Mutual Improvement Society:—

That judging be done on the point system, desirable qualities being as follows:—

	Points.
1. Bottles to preserve a perfect vacuum after all screw bands, clips, &c., have been removed . . .	6
2. Fruit to be uniform in size	4
3. Clearness of syrup or liquid	4
4. Fruit to be of good colour	4
5. Wholeness of the fruit and general good appearance .	6
	24

N.B.—Plums, Damsons, Cherries, and other stone fruits should be perfectly sound and unbroken in the skin. Bottles should be quite full, and the fruit within evenly balanced.

From the Beckenham Horticultural Society:—

Experts should be invited to draw up a code of rules based on a number of points to be decided upon according to the difficulty experienced—for instance, Raspberries should count more points than Plums, and Red Currants than Cherries.

There should be two sections—culinary and dessert. In the case of dessert the judges to award points for flavour. Bottled fruits should include Tomatos and Rhubarb, which are generally classed as vegetables.

A vote of thanks to the Chairman closed the afternoon's proceedings.

GENERAL MEETING.

OCTOBER 22, 1912.

Mr. EDWARD BUNYARD in the Chair.

Fellows elected (38).—C. Allen, F. G. Archer, Miss S. A. Besant, Lady Bosanquet, Mrs. E. Byrd, A. E. Course, Lady Crewe, Lady Dale, Miss D. G. Drabble, Miss M. Drabble, F. J. Fletcher, W. Gay, A. E. Hamling, Sir Charles Henry, Bart., Hon. Mrs. Aubrey Herbert, G. E. Hoghton, H. S. Hotblack, E. Lloyd Jones, Mrs. J. W. Kemball, Mrs. T. O. Lazenby, Elizabeth Lady Lewis, Lady Victoria Manners, A. J. Maxwell, O. B. Milnes, L. Morgan, F. R. Morris, Mrs. J. W. Philips, Miss K. D. Pilkington, Miss A. L. M. Ridley, Mrs. Guy Ridpath, Miss I. M. Robertson, A. Sandys, Mrs. L. Smith, William Smith, J. S. Watkins, Miss G. Whish, Mrs. Wrohan, Miss A. H. Young.

Fellows resident abroad (3).—K. Roy (India), N. Sett (India), J. Watzinger (Germany).

Associates (3).—Miss A. M. Cooper, Miss K. D. Mortimer, Miss F. B. Tanner.

A lecture on "The Senses of Plants" was given by the Rev. Professor G. Henslow, V.M.H. (See p. 515.)

GENERAL MEETING.

NOVEMBER 5, 1912.

Professor W. BATESON, D.Sc., F.R.S., V.M.H., in the Chair.

Fellows elected (22).—Miss A. R. Baily, J. Bale, Miss J. E. Barton, C. Boatwright, Mrs. A. H. Cooke, Mrs. C. Curtis, Miss A. M. Ellenor, Mrs. A. M. Favarger, F. T. Garner, Lady Harrington, N. Lambert, Mrs. E. Lee-Warner, R. A. Malby, J. W. Marsden, G. F. Padbury, Mrs. Scott Plummer, Lady Slade, A. E. Tubb, A. W. Wills, G. F. Wills, Mrs. E. Woolley, Mrs. Cecil H. Wray.

Fellow resident abroad (1).—Leslie A. Cox (South Africa).

Society affiliated (1).—Halesworth and District Gardeners' Mutual Improvement Association.

A lecture on "Double Flowers" was given by Miss Edith R. Saunders. (See p. 469.)

EXHIBITION OF ORCHIDS.

HELD AT THE SOCIETY'S HALL, VINCENT SQUARE, S.W.

NOVEMBER 5 AND 6, 1912.

THE JUDGES.

Alexander, H. G., The Gardens, Westonbirt, Tetbury, Glos.
Armstrong, T., Sandhurst Park, Tunbridge Wells.

Bolton, W., Wilderspool, Warrington.
Butler, W. W., Southfield, Norfolk Road, Edgbaston.
Chapman, H. J., Oakwood Gardens, Wylam-on-Tyne.
Cobb, W., Normanhurst, Rusper, Horsham.
Colman, Sir Jeremiah, Bart., V.M.H., Gatton Park, Reigate.
Crawshay, de Barri, Rosefield, Sevenoaks.
Curtis, C. H., 2 Adelaide Road, Brentford, Middlesex.
Fowler, J. Gurney, Glebelands, South Woodford.
Hanbury, F. J., Brockhurst, East Grinstead.
Hatcher, W. H., Rawdon, Leeds.
McBean, A. A., Cooksbridge, Sussex.
Moore, G. F., Chardwar, Bourton-on-the-Water.
O'Brien, J., V.M.H., Marian, Harrow-on-the-Hill.
Rolfe, R. A., 12 Lawn Crescent, Kew.
Shill, J. E., The Dell Gardens, Englefield Green.
Thwaites, R. G., 23 Christchurch Road, Streatham, S.W.
Veitch, Sir Harry, V.M.H., 34 Redcliffe Gardens, S.W.
White, W. H., Burford Lodge Gardens, Dorking.
Wilson, Gurney, Glenthorne, Haywards Heath.

OFFICIAL LIST OF AWARDS.

Class 1.—Effectively arranged Group of Orchids. Open.
Messrs. Charlesworth, Haywards Heath: Gold Medal.
Messrs. Sander, St. Albans: Gold Medal.

Class 2.—Effectively arranged Group of Orchids. Amateurs.
No entries.

Class 3.—Group of Orchids arranged in a space not exceeding 150 sq. ft. Amateurs.
G. F. Moore, Esq., Chardwar, Bourton-on-the-Water (gr. Mr. W. Page): Gold Medal.
Sir Jeremiah Colman, Bart., Gatton Park, Reigate (gr. Mr. J. Collier): Large Silver Cup.
H. S. Goodson, Esq., Fairlawn, West Hill, Putney (gr. Mr. G. E. Day): Small Silver Cup.
J. Gurney Fowler, Esq., Glebelands, South Woodford (gr. Mr. J. Davis): Silver-gilt Flora Medal.

Class 4.—Group of Orchids arranged in a space not exceeding 150 sq. ft. Nurserymen.
Messrs. Stuart Low, Bush Hill Park, Enfield: Gold Medal.

Class 5.—Group of Orchids arranged in a space not exceeding 100 sq. ft. Amateurs.
E. R. Ashton, Esq., Broadlands, Camden Park, Tunbridge Wells: Silver Cup.
F. DuCane Godman, Esq., South Lodge, Horsham (gr. Mr. G. Giles): Silver Flora Medal.

Class 6.—Group of Orchids arranged in a space not exceeding 100 sq. ft. Nurserymen.

Messrs. McBean, Cooksbridge: Silver Cup.
Messrs. J. Cypher, Cheltenham: Silver-gilt Flora Medal.
Mr. E. V. Low, Haywards Heath: Silver Flora Medal.
Mr. H. Dixon, Wandsworth Common: Silver Banksian Medal.
Mr. S. W. Flory, Tracy's Nursery, Twickenham: Silver Banksian Medal.
Messrs. J. Veitch, Chelsea: Silver Banksian Medal.
Mr. Treseder, Ard Cairn Nurseries, Cork: Bronze Banksian Medal.

Class 7.—Group of Cattleyas, Laelias, and Brassavolas: Species, Hybrids, and Varieties. Open.

Lt.-Col. Sir George Holford, K.C.V.O., Westonbirt, Tetbury (gr. Mr. H. G. Alexander): Gold Medal and Silver-gilt Lindley Medal.

Class 8.—Group of Cattleyas, Laelias, and Brassavolas: Species, Hybrids, and Varieties. Amateurs.

No entries.

Class 9.—Group of Cattleyas, Laelias, and Brassavolas: Species, Hybrids, and Varieties. Nurserymen.

No entries.

Class 10.—Group of Cypripediums: Species, Hybrids, and Varieties. Amateurs.

Lt.-Col. Sir George Holford, K.C.V.O.: The Davidson Silver Cup.

Class 11.—Group of Cypripediums, Species, Hybrids, and Varieties. Nurserymen.

Messrs. J. Cypher, Cheltenham: Silver Cup.
Mr. G. W. Miller, Clarkson Nurseries, Wisbech: Silver Banksian Medal.

Class 12.—Group of not more than 50 Plants of Vanda coerulea. Open.

Lt.-Col. Sir George Holford, K.C.V.O.: Gold Medal and Silver-gilt Lindley Medal.

Class 13.—12 Plants of Vanda coerulea. Amateurs.

No entries.

Class 14.—12 Plants of Vanda coerulea. Nurserymen.

No entries.

Class 15.—6 Plants of Vanda coerulea. Amateurs.

No entries.

Class 16.—6 Plants of Vanda coerulea. Nurserymen.

No entries.

Class 17.—Group of Odontoglossums and Odontiodas: Species, Hybrids, and Varieties. Open.

No entries.

Class 18.—Group of Odontoglossums and Odontiodas: Species, Hybrids, and Varieties. Amateurs.

No entries.

Class 19.—Group of Calanthes: Species, Hybrids, and Varieties. Amateurs.

No entries.

Class 20.—Group of Calanthes: Species, Hybrids, and Varieties. Nurserymen.

No entries.

Class 21.—Specimen Orchid. Amateurs.

No entries.

Class 22.—3 Specimen Orchids. Amateurs.

Mrs. Cookson, Oakwood, Wylam-on-Tyne (gr. Mr. H. J. Chapman): Silver-gilt Banksian Medal.

Class 23.—6 Specimen Orchids. Amateurs.

No entries.

Class 24.—Specimen Orchid. Nurserymen.

Mr. S. W. Flory, Twickenham: Silver Banksian Medal.

Class 25.—3 Specimen Orchids. Nurserymen.

No entries.

Class 26.—6 Specimen Orchids. Nurserymen.

No entries.

Class 27.—Collection of Orchids of botanical interest; those with coloured or variegated foliage need not necessarily be in flower. Amateurs.

Sir Jeremiah Colman, Gatton Park, Reigate (gr. Mr. J. Collier): Silver Cup.

Class 28.—Collection of Orchids of botanical interest; those with coloured or variegated foliage need not necessarily be in flower. Nurserymen.

No entries.

The four following classes were restricted to growers residing in or north of Montgomeryshire, Shropshire, Staffordshire, Derbyshire, Leicestershire, Rutlandshire, and Lincolnshire.

Class 29.—Group of Orchids. Open.

Messrs. Mansell & Hatcher, Rawdon, Leeds: Large Silver Cup.

Class 30.—Group of Cypripediums: Species, Hybrids, and Varieties. Open.

No entries.

Class 31.—Group of Cypripediums: Species, Hybrids, and Varieties. Amateurs.

No entries.

Class 32.—Specimen Orchid. Open.

No entries.

GENERAL MEETING.

November 19, 1912.

Mr. Edward White in the Chair.

Fellows elected (26).—Mrs. Anthony Abdy, Mrs. R. Bush, Miss A. R. Coward, Thomas Delves, Miss F. F. Dixon, W. T. Dulake, A. J. Everitt, J. B. Harris, Mrs. E. Hesketh, J. Horlick, Miss E. M. Hughes, Miss Gertrude Hunter, Mrs. E. Inglis, Dr. G. H. Jones, Alfred Lythall, H. J. Martin, Miss L. G. Munckton, E. Pritchard Nicholson, Mrs. F. Oakley-Fisher, E. A. Orchard, F. G. Parkes, J. Parkes, Miss A. E. Speirs, Mrs. G. Stewart, P. Thoo, William J. B. Tippetts.

Fellows resident abroad (2).—J. Maclean (New Zealand), Miss Maud Oxenden (Jersey).

Associates (2).—A. Bury, Miss G. C. Nuttall.

A lecture on "Some Gardens in and around Bournemouth" was given by G. G. Hamilton, F.R.C.S.

GENERAL MEETING.

December 3, 1912.

Sir Albert L. Rollit, D.L., in the Chair.

Fellows elected (42).—S. G. Asher, Mrs. Brownlow Atlay, Colonel Reginald Barclay, B. C. Halsey Bircham, Mrs. John Brindley, Mrs. A. C. Brown, Mrs. Bruen, Henry Catling, Mrs. Montague A. Colman, Peter Craven, Mrs. de Carteret, Dryden Donkin, E. W. Fry, Miss Winifred M. Galloway, T. Goodier, W. H. Grant, Lady Harvey, Mrs. Hawkins, G. Ing, R. W. Janes, Miss Johnson, Mrs. A. G. Johnson, W. Jones, P. Kaye, Mrs. Henry Klein, Charles Lake, J. Jackson Lister, L. Loewenstein, C. Mann, Mrs. F. J. Medforth, A. B. Neal, J. R. Odgers, Harry Pierce, H. S. C. Rees, Kay Robinson, E. G. Saunders, G. H. H. Scott, Herbert S. Smiley, W. Eaton Smith, Miss L. M. Soames, Mrs. H. Wallis, S. E. H. Walmisley.

Fellows resident abroad (4).—M. Barnett (N.Z.), D. F. Foxwell (British Columbia), S. Luijt (Holland), F. S. Reeves (Ontario).

Societies affiliated (2).—Cricklewood Horticultural Society, Little Thurrock and District Horticultural Society.

A lecture on "The Vegetation of the Island of St. Leger in Lago Maggiore," by Madame Tzikos de St. Leger, was read by the Secretary. (See p. 503.)

GENERAL MEETING.

December 17, 1912.

J. Gurney Fowler, Esq., in the Chair.

Fellows elected (24).—Mrs. Arthur D. Blyth, John L. Bolden, R. G. H. Boulton, Mrs. J. A. Browne, the Hon. Mrs. Charles R. Burn, H. R. Chantry, Harry Clarke, John Dowell, Mrs. W. S. Draycott, M. C. Duchesne, Lady Carr Glyn, Eustace J. Harrison, Edward Harriss, Oscar Langenbach, Miss C. M. Lidderdale, Mrs. Carr Lloyd, Hugh Mitchell, E. M. Mobsby, Mrs. A. Newsholme, Mrs. J. S. Ralli, Miss I. L. Schmidt, Graham P. Spicer, Miss F. M. Van, W. Wells.

Fellows resident abroad (9).—Peter Black (N.Z.), T. Gordon Bunting (Canada), F. Fleischman (New York), George Fraser (Canada), Colonel E. A. P. Hobday (Canada), M. C. A. C. Kroeger (Canada), A. Robichon (France), F. Maclure Sclanders (Canada), H. Llewellyn Wilkinson (India).

Societies affiliated (2).—Bristol Chrysanthemum Society, Flixton, Davyhulme, and District Horticultural Society.

SCIENTIFIC COMMITTEE.

SEPTEMBER 10, 1912.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and eight members present.

Erica cinerea malformed.—Mr. E. M. Holmes showed a specimen of *Erica cinerea* from Ringwood in which the corolla was divided to the base, so that the flowers had the appearance of those of Ling. He also showed a specimen from Studland in which the flowers were replaced by very numerous bracts, almost as in the Wheat-ear Carnation.

Malformed Armeria.—Mr. A. W. Hill, M.A., reported that he had examined the flowers sent to the last meeting, August 27 (see p. cxxv), in which the corolla was replaced by a calyx, so that there were two calyces, and had failed to find either fungus or mite present to account for it. It was suggested that some pest, such as eelworms, had attacked the roots.

Sweet Pea with proliferous inflorescence.—Mr. Fraser, F.L.S., showed an inflorescence of Sweet Pea which after flowering had elongated and produced leaves and flowers to the number of fourteen in all.

Lysimachia vulgaris.—Mr. Fraser also showed a shoot of *Lysimachia vulgaris* which had grown out of a shady position in a horizontal fashion, and the leaves had arranged themselves as in a shoot of *Polygonatum*.

Watsonia.—Mr. Worsley showed a specimen of *Watsonia iridifolia* which differed in some respects, but especially in its extreme robustness, from the variety *O'Brienii* (also called *Ardernii*). It was thought probable that it was merely a robust form of that variety.

Musa Bakeri.—Mr. Worsley also showed staminate flowers of *Musa Bakeri* from a plant raised by him from seed.

Certificate of Appreciation.—The Council have awarded a Certificate of Appreciation to Mr. C. H. Hooper for his work in connexion with the pollination of hardy fruits.

Seeds of Parrot Tulips.—Some fruits of Parrot Tulips were sent from Sussex, but on examination the seeds contained were found to possess no embryo.

SCIENTIFIC COMMITTEE, SEPTEMBER 24, 1912.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and nine members present.

Lilium candidum.—Mr. Bowles exhibited a remarkably vigorous specimen of the double form of *Lilium candidum*.

Gall on Willow.—Mr. Fraser, F.L.S., showed a rather small example of the gall on *Salix fragilis* produced by the mite *Eriophyes salicis*, collected on the bank of the Brent, near Ealing. Mr. W. Marshall, V.M.H., also sent an example of this gall collected on the bank of the Dart, Kent. It is only a few years since the first specimen recorded as British was shown before this Committee, but several specimens have since been received from various parts of South-East and East England.

'Wheat-ear' Sweet William.—Mr. Fraser also showed a specimen of Sweet William with the bracts multiplied as in the 'Wheat-ear' Carnation.

Cirrhopetalum miniatum.—Mr. Rolfe, A.L.S., drew attention to a *Cirrhopetalum* exhibited by Messrs. Sander, St. Albans, as having been introduced from Annam with *Dendrobium Bronckartii.* It resembled *C. gracillimum* Rolfe, especially in its caudate, almost thread-like lateral sepals, and in the strongly ciliate dorsal sepal and petals, but differed in having vermilion-coloured flowers, with the hairs of the dorsal sepal and petals yellow. His first knowledge of the plant was in September 1910, when it was sent to Kew for determination from the Royal Botanic Garden, Glasnevin, with the information that it had been purchased from Messrs. Sander as a plant imported with *Dendrobium Bronckartii.* It was then named and described as *Cirrhopetalum miniatum* Rolfe. Afterwards a painting was received from M. Maurice Valcke, a collector for Messrs. T. Pauwels, Meirelbeke, Belgium, who stated that he met with the plant at Haut Laos, between Siam and Cochin China.

Erica cinerea malformed.—Mr. Hill, M.A., showed a specimen of *Erica cinerea* malformed in the same way as those exhibited by Dr. Rendle on a previous occasion, this time from wild plants collected in South Devon.

Green-berried Elder.—Mr. J. Bennet-Poë, V.M.H., sent specimens of the albino form of the Elder in which the ripe fruits are greenish (as in white grapes). Some members of the Committee thought them sweeter than the black form.

Aristolochia Clematitis fruiting.—Mr. Bowles showed fruits of *Aristolochia Clematitis* from his garden at Myddelton House, Waltham Cross, containing ripe seeds.

Fruit of Pyrus Niedzwetzkyana.—He also showed, on behalf of Canon Ellacombe, fruits of *Pyrus Niedzwetzkyana*, in which the flesh is deeply coloured, as are all parts of the tree.

Verbascum with galls.—He also showed the curious proliferations which are sometimes noticed at the base of Verbascums, and which have previously been shown before the Committee, but which were in the present examples growing some distance up the stem.

Albino forms of Geranium Robertianum.—Mr. Bowles also showed the two albino forms of *Geranium Robertianum*, one with a red stem, the other with a green, which have maintained themselves for a long time in his garden. Almost all the plants of the latter form appear

to be traceable to one or two sources, and the Committee would be glad to hear of its occurrence in a wild state.

Helenium cupreum virescent.—Mr. J. Hudson, V.M.H., sent a specimen of a virescent and proliferous form of *Helenium cupreum* from the garden at Gunnersbury.

Alpine plants attacked by dodder.—Miss Willmott, V.M.H., sent an interesting series of alpine plants attacked by a species of dodder, including *Sedum album*, *S. elongatum*, *Daphne alpina*, a mossy Saxifrage, *Thymus Serpyllum*, *Campanula rotundifolia*, *Thalictrum minus*, *Phlox subulata*, and *Dianthus deltoides*. The species of *Cuscuta* could not be identified as it had no flowers.

"Reversion" in Black Currants.—Mr. E. A. Bunyard sent an interesting series of specimens illustrating his idea that the "reversion" to which the attention of the Committee was recently directed (see pp. cxxiii, cxxiv) was the result of the development of lateral branches after injury to the terminal bud. Among the specimens sent (which did not appear to be all of one variety) were shoots showing mechanical injury, shoots probably injured by the shoot-cutting weevil, and shoots injured by "big bud," all exhibiting the reverted foliage, with normal shoots for comparison. The hypothesis, the Committee considered, hardly accounted for the persistence of the "reversion" so that whole bushes were affected season after season.

Upon this subject Mr. Bunyard writes in *Gard. Chron.*, August 24, 1912, p. 159, as follows:—

"Nettleleaf" or "Reversion" in Black Currants.—It seems uncertain if this may be considered a new "disease," or if it is merely that more attention is now paid to such matters than in former days. Too much stress cannot be laid upon the point that more facts are needed as to its distribution and development before any opinion can be formed as to its cause. In the hope that a suggested explanation may stimulate the production of these facts, I venture to place before your readers a tentative solution of this question. The facts which I have observed and gleaned are as follows: (1) It may be seen in one-year cuttings and in bushes of all ages. (2) It is not confined to any one variety. (3) It is often followed by "big bud." (4) It is reported to have a tendency to spread from a given centre in a plantation—that is, where in one year one bush may be affected, the following years show neighbouring bushes also suffering. (5) A close examination shows that in all cases (in the writer's experience) the leading bud of the shoot has been damaged by birds or breakage, and this has caused the side buds to develop fresh shoots, and it is these shoots which show the well-known "nettleleaf" appearance. Conversely, it of course holds that in no case is it seen on a main shoot which has its leading bud growing and undamaged. (6) A similar leaf variation may be seen occasionally in Red Currants. One other consideration must be put forward, and that is that the Black Currant is subjected to a very severe method of pruning, and all fruit is borne upon vigorous wood of the current year. The explanation I suggest is this: The damage to the leading bud may

be caused by various means, of which no doubt the "big-bud" mite is the chief. The twig-cutting weevil (*Rhynchites coeruleus*) may also cut a whole shoot across whilst soft and growing. When this is done the side buds at once send forth weak branches instead of developing into fruit buds, and these are the so-called "reverted" branches. The fruit which may appear on these secondary shoots will naturally be small and weak, as there has not been time to mature fruit-buds such as would have been produced naturally on the strong main branches. If the bud damage is caused by mite, its spread to neighbouring trees is easily understood. It is unfortunate that the term "reversion," with its implication of throwing back to a remote or "wild" ancestor, has been used, as it begs the question entirely. The idea of a single bud variation is well known, but I doubt if a case of a whole tree "reverting" in one jump has ever been known to occur. I suggest that what has happened is that the normal course of pruning and bud development having been upset the fruit suffers in size. If this is so, it would follow that entire removal of old branches and the resultant forcing up of young growth from below would overcome the "reversion," and the tree would, in the absence of a recurrence of the cause, produce fruit once again of a normal size. It will be interesting to know if any of your readers has tried this remedy, which, if it proved successful, would offer a conclusive proof of the truth or falsity of the above suggested explanation.

Scientific Committee, October 8, 1912.

Mr. R. Hooper Pearson, F.R.H.S., in the Chair, and eight members present.

Bulbophyllum Gentilii.—Mr. O'Brien, V.M.H., showed, on behalf of Sir Fred. Moore, a specimen of *Bulbophyllum Gentilii* Rolfe (see *Orchid Review*, October 1912, p. 314). This species has the nectar glands placed on the upper side of the dorsal sepal. It has been confounded with *B. Calamaria* (*Bot. Mag.* 4088), and the two species are mixed in herbaria.

Mentha viridis var.—Mr. Fraser, F.L.S., showed a specimen of the *Mentha* described by Sir John Smith under the above name, occurring wild about Bocking and Maidstone.

Nomenclature of Orchid hybrid.—The Committee considered the question of the nomenclature of a hybrid Orchid referred to it by the R.H.S. Council. The alleged parentage was *C.* × *Fabia alba* (*C. labiata* × *C. Dowiana aurea*) × *C. Warscewiczii* var. 'Frau Melanie Beyrodt,' and the name suggested for the seedling was *C.* × *Harrisiana*. The Committee considered that this name transgressed the recommendations of the Vienna Botanical Congress regarding plant-names in that it was too much like existing names in the same genus, thereby tending to confusion (*e.g.* *Cattleya Harrisoniana*, *C.* × *Harrisii*, and *C. Harrisae*); the name was therefore not tenable. Further, they thought

that although Art. xii. of the rules of horticultural nomenclature (JOURNAL R.H.S., vol. xxxvii. p. 151) permitted the use of names of Latin form (with signs of hybridity) for such crossbred plants as this, it would be more convenient if vernacular names were chosen, generally from the classics. In the instance under consideration, the Committee recommended that the exhibitor should be asked to choose such a name.

Tomatos with pale, round spots.—Some Tomato fruits with pale spots, circular in outline, about ¼ inch in diameter, and each having a minute black spot in the centre, were sent from Highgate. Microscopic examination failed to reveal the presence of a fungus, and the Committee concluded the damage was probably the result of punctures by a hemipterous insect, possibly white fly, or a species of *Lygus*.

Potatos with super-tuberation.—Potatos showing growth after the first stage of tuber production were sent from Bush Hill Park. These are frequent this season, owing to rains during August.

Glassiness in Apple.—A specimen was sent from Battle showing the peculiar soddening of the tissue called glassiness. This is not at all infrequent this season, several specimens having been received at the Society's laboratory, and Mr. Chittenden said he had found similar fruits on trees at Wisley (on the sunny side of the tree) as early as July.

SCIENTIFIC COMMITTEE, OCTOBER 22, 1912.

Mr. E. A. BOWLES, M.A., F.L.S., F.E.S., in the Chair, and eleven members present.

Bordeaux injury.—Mr. Hill, M.A., showed, on behalf of Mr. Massee, V.M.H., some Apples to illustrate the russeting due to the action of Bordeaux mixture upon their skins.

Antirrhinum sporting.—Mr. Chittenden showed from a garden near London stems of an Antirrhinum bearing short, leafy growths in the axils of the bracts instead of flowers. The leaves were very small. A similar specimen was subsequently sent by Messrs. R. Veitch, of Exeter.

Rhododendron sporting.—Sir George Holford exhibited a Rhododendron raised from the cross *R. javanicum* 'Ruby' × *R. javanicum* 'Ne Plus Ultra.' It bore two inflorescences, one having bright red flowers, the other not quite so deep in colour and with yellow corolla tubes. The two parents had both crimson-scarlet flowers of slightly different shades. The flowers on the two trusses were of the same age. Ten plants of the cross had flowered, each bearing flowers of a richer colour than either of the parents, but none of the others had shown similar sporting proclivities.

Grey Oak.—Dr. Voelcker sent a piece of Oak wood of a peculiar greyish-blue colour from a tree struck by lightning. The Committee thought the coloration was probably the result of exposure to sun and air, especially as the tint approached that of weathered Oak palings.

Albino Geranium Robertianum.—Mr. Eric M. Luckin, of Feltham, wrote: "With reference to your inquiry as to wild albino forms of *Geranium Robertianum*, some four years ago I discovered a plant growing in a meadow bearing albino flowers, stems green. The two years following I revisited the spot and found the plant, but this year I failed to locate it, and fear it has been destroyed. The meadow is near Haywards Heath, Sussex."

Ficus pumila, fruiting shoots.—Mr. H. Hainsworth, of Blackheath, sent the creeping shoots of *Ficus pumila* (*F. repens* of gardens), with the upright-growing large-leaved shoots upon which the fruits are borne, for comparison.

Scientific Committee, November 5, 1912.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and nine members present.

Horse-chestnut with twin petioles.—Mr. Bowles showed petioles of Horse-chestnut in pairs, springing from a connate base, from his garden at Waltham Cross. Only two such specimens were found and the leaf-blades borne by them were quite normal.

Apples with more than normal seeds.—Mr. Chittenden, F.L.S., drew attention to the production in some varieties of Apple of more than the normal number of seeds. The usual number of ovules produced by the Apple is two in each cell, and this is regarded as one of the chief characters separating *Pyrus* from *Cydonia*, in which there are usually more than two. He had found in 'Frogmore Prolific' Apple a large number of fruits containing more than two seeds in a cell, and the same in fruits of 'Duchess's Favourite.' Prof. W. Somerville had first drawn his attention to the phenomenon some years ago in American Apples, but Mr. Chittenden had not hitherto seen it in British Apples. The seeds were borne in two series of two, one on each carpel margin.

Variations in wild flowers.—Mr. T. H. Dipnall sent the following list of variations which he had noticed in the form and coloration of British wild flowers:—(Double flowers) *Ranunculus acris*, *Papaver Rhoeas* (one flower and another with all flowers semi-double), *Cardamine pratensis*, *Saponaria officinalis*, *Silene noctiflora*, *Knautia arvensis* (like a large lavender Thrift). Colour variations: (White) *Viola odorata* (common and red also), *V. canina*, *Lychnis Flos-cuculi*, *L. diurna*, *Geranium molle*, *G. lucidum*, *Ononis arvensis*, *Vicia sepium*, *Campanula rotundifolia*, *C. Trachelium*, *Myosotis sylvatica*, *Ajuga reptans*, *Lamium purpureum*, *Primula vulgaris*, *Orchis mascula*, *O. maculata*, *O. Morio*, *Gymnadenia conopsea*, *Ophrys apifera*, *Agraphis nutans*, *Fritillaria Meleagris*, *Adoxa moschatellina*, *Cnicus palustris*, *Centaurea nigra*, *Symphytum officinale*. (Pale yellow) *Ranunculus acris*, *Scrophularia nodosa*, *Sarothamnus scoparius*. (Dull purple) *Papaver Rhoeas*. (Pink) *Crataegus Oxyacantha*, *Calystegia sepium*, *Primula vulgaris*, *Lychnis vespertina*, *Erica cinerea* (very

pale), *Orchis Morio*, *Agraphis nutans*. (Blue) *Anagallis arvensis*. (Pale blue) *Agraphis nutans*, *Campanula Trachelium*. (Salmon pink) *Papaver Rhoeas*.

Catasetum macrocarpum, female flower.—Mr. G. Rae Fraser, Letchmore Heath, Herts, sent an inflorescence of *Catasetum macrocarpum* bearing five female flowers, from the same plant as the one exhibited on October 8, 1910. He remarked that the plant has made three futile attempts to flower since then, and at the fourth had produced the present spike. Mr. R. A. Rolfe reported that it agreed with the plant figured as *Monacanthus viridis* by Lindley in the *Botanical Register* (t. 1752), from a plant which flowered with Lord Fitzwilliam, at Wentworth, which is now known as the female of *Catasetum macrocarpum* Rich. It is not, however, the original *Monacanthus viridis* Lindl., which is the female of another species.

Scientific Committee, November 19, 1912.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and eleven members present.

Variation in Nephrolepis.—Mr. W. Marshall, V.M.H., sent a plant of *Nephrolepis exaltata* var. *todeaoides*, which, after once repotting, had been allowed to grow as it liked. It had given rise to fronds exactly similar to those of the type of *N. exaltata* and also to numerous other forms, including *todeaoides*, some with more, some with less, frequently divided pinnules than that plant. The case of this fern is a very curious one, paralleled, however, by certain other garden plants. The type was introduced from the Tropics about 1793, and gained the reputation of being the most useful of its genus. A few varieties were recognized during the nineteenth century, but it was not until after the beginning of the twentieth century that many made their appearance, and since then they have come thick and fast. The first of them apparently came from America, but others have appeared in England since. The striking exhibit of Messrs. May in the Science and Education Section at the Royal International Exhibition showed the origin and course of variation in the plants of this genus in a remarkable manner.

The Glastonbury Thorn.—Mr. W. E. Ledger showed flowers of the well-known Glastonbury Thorn from his garden at Wimbledon. This variety (*Crataegus Oxyacantha* var. *praecox*) apparently flowers on short shoots, which have no definite resting period as in the normal form of the species, where spurs producing flowers in alternate years are the rule, with a definite winter rest. The Committee could call to mind no analogous cases among apples or pears, and would be glad to learn of any that may be known.

Drosophyllum lusitanicum.—Mrs. Bergheim, of Belsize Park, sent plants of this interesting carnivorous plant. The genus is allied to *Drosera*, but the foliage is erect in habit, and the glandular tentacles

are on the lower (exposed) surface of the leaves instead of the upper as in *Drosera*.

Mistletoe on Pear.—Sir Harry Veitch, V.M.H., sent two branches of Pear in which Mistletoe had been sown, to illustrate the difficulty experienced in getting the parasite to establish itself on that tree. In both cases the seed had germinated but the branches had died, and they were typical of all the infections tried.

Oncidioda × '*Marjorie.*'—Messrs. Charlesworth sent a plant resulting from a cross between *Cochlioda Noezliana* and *Oncidium Forbesii.* Several crosses between members of these genera have now flowered, and Messrs. Charlesworth were awarded a Certificate of Appreciation in 1910 in recognition of their work in demonstrating the possibility of uniting these genera, which, although sufficiently distinct morphologically, are evidently closely allied physiologically.

Ivy leaves diseased.—Mr. Bowles showed foliage of Ivy from Waltham Cross having numerous pale brown spots with a purplish margin.

Scientific Committee, December 3, 1912.

Mr. E. A. Bowles, M.A., F.L.S., F.E.S., in the Chair, and twelve members present.

Prunus Miqueliana.—Mr. G. Wilson, F.L.S., drew attention to this beautiful shrub, which flowers in the open in December in Sussex and elsewhere. Its appearance suggests a garden origin, for the rosy flowers are semi-double.

Fern in bottle.—Mr. Fraser, F.L.S., showed a specimen of a Fern, *Cystopteris fragilis*, growing in a bottle, in which it was found in a garden. Though this Fern usually loses its leaves in July, the present specimen was still green.

Orange-fruited Holly.—Mr. Bowles showed orange-coloured fruits from a Holly in his garden. The tree is probably identical with that referred to in Dallmore's *Holly, Yew, and Box* under the name *Ilex Aquifolium fructu-aurantiaco.* It is there suggested that this is a seedling from the yellow-fruited variety, and the tree in Mr. Bowles's garden is apparently of similar origin.

Laelia pumila × *Laelio-Cattleya* × 'Ophir' (*Laelia xanthina* × *Cattleya aurea*).—Mr. G. Wilson said this hybrid with cream-white sepals and petals and purple labellum was raised by Mr. R. G. Thwaites, of Streatham Hill, and was shown by him in support of his hypothesis that white flowers are produced by a mixture of red, blue, and yellow.

Lychnis × *Arkwrightii.*—A Botanical Certificate was awarded to this plant raised by Mr. J. S. Arkwright and exhibited by him on July 16, 1912. The record of this certificate was inadvertently omitted from the Minutes of that date.

FRUIT AND VEGETABLE COMMITTEE.

SEPTEMBER 3, 1912.

SUB-COMMITTEE AT WISLEY.

MR. GEORGE BUNYARD, V.M.H., in the Chair, and six members present.

The following produce from the trials was recommended for the inspection of the full Committee at their next meeting:—

Potatos:—No. 29. British Queen, **A.M.**
No. 35. James Gibson.
No. 41. Conquest.
No. 49. Great Scot, **A.M.**
No. 53. Harbinger, **A.M.**
No. 63. The Diamond.
Autumn-fruiting Strawberry 'Merveille de France.'

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 10, 1912.

MR. G. BUNYARD, V.M.H., in the Chair, and ten members present.

Awards Recommended:—

Silver Knightian Medal.

To H. B. Brandt, Esq. (gr. Mr. Heron), Nutfield, for fruit.
To A. W. Merry, Esq. (gr. Mr. Kelf), Welwyn, for fruit.

Silver Banksian Medal.

To H. V. Woodgates, Esq., Worcester Park, for Apples.

Award of Merit.

To Potato 'The Diamond' (votes, unanimous), from Messrs. Barr, Covent Garden.

To Strawberry 'Merveille de France' (votes, 6 for, 2 against), from Messrs. Bunyard, Maidstone. An autumn-fruiting variety of vigorous habit. It is a good cropper, and the fruits are of medium size, round, blood-red; seeds prominent, pale green; flesh white, tinged with red; flavour good.

Highly Commended.

Potato 'Conquest,' from Messrs. Dobbie, Edinburgh.
Potato 'James Gibson,' from Mr. R. Staward, Hertford.

The above varieties of potatos and the strawberry were grown in the trials at Wisley. For descriptions of the former see Report of Potato Trial at Wisley (p. 565).

Cultural Commendation.

To Lord Llangattock (gr. Mr. Coomber), Monmouth, for Pine-apples.

Other Exhibits.

Messrs. Barr, Covent Garden: Melon.
Mr. E. A. Bush, Southsea: seedling Apple.
Messrs. Cooling, Bath: seedling Apples and Cob Nuts.
G. E. Dyke, Esq., Milborne Port: seedling Apples.
Mr. A. G. Gentle, Little Gaddesden: Melon 'Gaddesden Gem.'
Mr. T. Kitley, Bath: Apple 'Jackanapes.'
Mr. W. Pope, Newbury: seedling Apples.
Mr. G. H. Quint, Princes Risboro': Apple 'Quint's Seedling.'
Countess of Selkirk, Kirkcudbright: Morello Cherries.

FRUIT AND VEGETABLE COMMITTEE, SEPTEMBER 24, 1912.

Mr. J. CHEAL in the Chair, and twenty-three members present.

Awards Recommended:—

Gold Medal.

To Messrs. Bunyard, Maidstone, for Pears.
To Mr. R. C. Notcutt, Woodbridge, for fruit.
To Messrs. Sutton, Reading, for vegetables.

Silver-gilt Knightian Medal.

To Messrs. Carter, Raynes Park, for vegetables.
To Messrs. Dobbie, Edinburgh, for Potatos.
To Menpes Fruit Farm, Purley, for Melons.
To Messrs. J. Veitch, Chelsea, for vegetables.

Silver Knightian Medal.

To C. Mocatta, Esq. (gr. Mr. T. Stevenson), Addlestone, for Peppers.

To Lady Wernher (gr. Mr. A. W. Metcalfe), Luton, for Apples and Pears.

Silver Banksian Medal.

To Mr. H. Hemsley, Crawley, for vegetables.

Bronze Banksian Medal.

To E. O. Sullivan, Esq., London, for vegetables.

To D. Vigo, Esq. (gr. Mr. A. E. Fox), Thaxted, for fruit and vegetables.

Award of Merit.

To Apple 'Turner's Prolific' (votes, unanimous), from Mr. C. Turner, Slough. Fruit very large, rather conical; skin pale green, with a slight orange flush on the exposed side; eye partly closed, in

a shallow, irregular basin; stalks short, half-inch long, rather thick, in a shallow cavity; flesh very crisp, rather acid, and of excellent quality for cooking. The tree is said to be a strong grower and free bearer.

Other Exhibits.

Mr. J. Binnington, Witley: Bananas.
W. B. M. Bird, Esq., Chichester: Apples.
Mr. H. F. Briggs, Watford: Melon.
Colonel Cox, Uxbridge: Tomatos.
G. H. Garrett, Esq., J.P., Saxmundham: Pears.
Mr. J. T. Good, Bushey: seedling Apple.
Mr. W. Hannon, Athlone: Apple 'William Hannon.'
Mr. W. Jamesson, Berkhamsted: Apple 'Dean of Lincoln.'
Locksheath Nurseries, Locksheath: Tomato 'Locksheath Wonder.'
F. Paget Norbury, Esq., Malvern: Apple 'Queen Caroline.'
Mr. W. Pope, Newbury: Apple 'Advance.'
Michael Stephens, Esq., Ewhurst: Melon 'Coverwood Seedling.'

Fruit and Vegetable Committee, October 8, 1912.

Mr. J. Cheal in the Chair, and nine members present.

Awards Recommended:—

Gold Medal.

To Messrs. J. Veitch, Chelsea, for fruit.

Silver-gilt Knightian Medal.

To Barnham Nurseries, Barnham, for fruit.

Silver-gilt Banksian Medal.

To Lady Cowper (gr. Mr. R. Staward), Panshanger, for Onions.
To Marquis of Ripon (gr. Mr. T. Smith), Kingston Hill, for Apples and Pears.

Silver Banksian Medal.

To H. Woodgates, Esq., Worcester Park, for Apples.

Other Exhibits.

Mr. W. Baker, West Norwood: Potato 'King Edward VII.'
Mr. Bradford, Laleham: seedling Apple.
Mr. P. Lewis, Hanwell: Pears.
Mrs. Mann, Horley: Pears.
Mr. McNeil, New Barnet: seedling Apples.

FRUIT AND VEGETABLE COMMITTEE, BRITISH FRUIT SHOW, OCTOBER 10, 1912.

Mr. A. H. PEARSON, J.P., V.M.H., in the Chair, and twenty-seven members present.

Awards Recommended:—

Cultural Commendation.

To Mr. H. F. Barnes, Chester, for Apple 'William Crump.'
To Mr. J. Vert, Audley End, for fruits of *Passiflora laurifolia edulis.*

Other Exhibits.

Mr. A. Andrews, Ashe: Apple 'Hon. Wm. Lowther.'
W. B. M. Bird, Esq., Chichester: Apple 'Mrs. W. Bird.'
Messrs. Cooling, Bath: Apples.
Messrs. Cutbush, Highgate: Raspberry 'Cutbush's Superlative.'
Mr. G. H. Mould, Cambridge: Apple 'St. Everard.'
Mr. C. Ross, V.M.H., Welford Park: Pear 'Marguerita.'

FRUIT AND VEGETABLE COMMITTEE, OCTOBER 22, 1912.

Mr. C. G. A. NIX in the Chair, and twelve members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. Bunyard, Maidstone, for Apples and Pears.

Silver Knightian Medal.

To Purfleet Council School, Essex, for fruit.

Silver Banksian Medal.

To Messrs. Dobbie, Edinburgh, for Parsley.

Award of Merit.

To Apple 'Guelph' (votes, unanimous, subject to its being exhibited again next year), from Mr. W. Pope, Welford Gardens, Newbury. Fruit of good size, round and of beautiful shape; eye large and open in a very shallow basin; stalk short and thick, not deeply inserted; flesh crisp, very juicy, and of excellent flavour. The tree is said to be a good and healthy grower.

Other Exhibits.

Miss Dixon, Edenbridge: Melons.
Miss Hale, Taunton: honey and marmalade.
Mr. W. Outram, South Croydon: Apple 'Outram's Pippin.'
Mr. C. E. Baring Young, East Barnet: Pears and Apples.

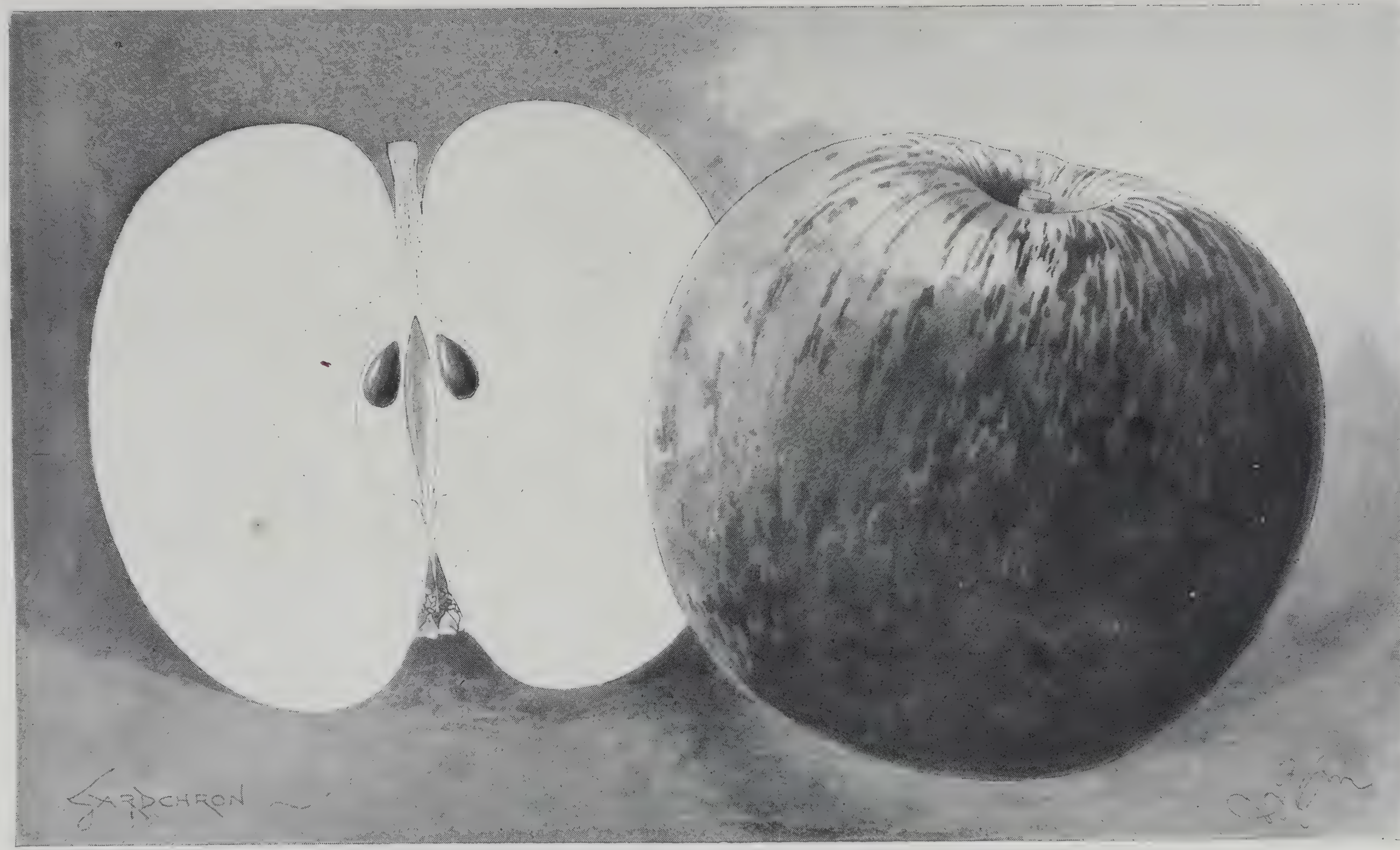


Fig. 192. Apple 'Crawley Beauty.' (*Cheal.*) (p. ccxliv.)

[*To face p.* ccxlii.

FIG. 193.—ACHILLEA 'PERRY'S WHITE.' (*Gard. Chron.*) (p. ccxlvi.)

Fruit and Vegetable Committee, November 5, 1912.

Mr. J. Cheal in the Chair, and eight members present.

Awards Recommended:—

Cultural Commendation.

To Messrs. Felton, Hanover Square, for an Orange tree in fruit.

Other Exhibits.

Messrs. Baylor Hartland, Ballintemple: Apple 'April Queen.'
Messrs. Bunyard, Maidstone: Quinces.
Mary Countess of Ilchester (gr. Mr. C. Dixon), Kensington: Pear 'Doyenné du Comice.'
Mr. J. Mason, Kendal: Apples.

Fruit and Vegetable Committee, November 19, 1912.

Mr. J. Cheal in the Chair, and sixteen members present.

Awards Recommended:—

Gold Medal.

To Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Elstree, for fruit.
To Messrs. J. Veitch, Chelsea, for vegetables.

Silver Knightian Medal.

To Mrs. W. Gordon Canning (gr. Mr. H. Prentice), Maisemore, Glos., for fruit.
To Messrs. Westmacott, London, for South African jams, &c.

Silver Banksian Medal.

To Messrs. Carter, Raynes Park, for Kales and Cabbages.
To Mrs. Miller, Marlow, for 'Moyleen' confections.
To Miss Sewell, South Kensington, for 'Elmhurst' jams, &c.

Bronze Knightian Medal.

To C. Goring, Esq. (gr. Mr. W. M. Bennett), Steyning, for Apples and Pears.

Cultural Commendation.

To Mr. R. Staward, Hertford, for Figs.

Other Exhibits.

Mr. T. Coptcoat, Buntingford: Apples.
Mr. A. Day, Marden: Apple 'Day's Pippin.'
Rev. Canon Duckworth, Frome: Apples.
Mr. F. A. Emmerton, Scole: Apples.

Mr A. Mackellar, Royal Gardens, Windsor: large 'Factor' Potato from Ireland; weight, 3 lb. 6 oz.

Mr. R. S. Morris, Worcester: Apples.

FRUIT AND VEGETABLE COMMITTEE, DECEMBER 3, 1912.

Mr. G. BUNYARD, V.M.H., in the Chair, and fifteen members present.

Awards Recommended :—

Gold Medal.

To Mrs. Banks, Grosvenor Square, W., for bottled fruits and vegetables, &c.

To the Agent-General of British Columbia, for fruit.

Silver Knightian Medal.

To Mrs. Miller, Marlow, for Moyleen confections.

To Messrs. Westmacott, Leadenhall Street, for South African jams, &c.

Silver Banksian Medal.

To Messrs. Cheal, Crawley, for new and rare fruits.

To Miss Sewell, Harcourt Terrace, S.W., for jams, &c.

Bronze Banksian Medal.

To Mr. D. E. Tower, Pershore, for bottled fruits.

Award of Merit.

To Apple 'Crawley Beauty' (votes, unanimous), from Messrs. Cheal, Crawley. Fruit large, handsome, of even outline; eye partly open, set in a wide shallow basin; stalk ¼ inch long, thick, set in a deep cavity; skin green, nearly covered with broadish, deep-set stripes; flesh white, very crisp and juicy, with a splendid acidity, and excellent when cooked. This should prove a valuable variety for market, as the tree is said to be a vigorous grower and free bearer. (Fig. 192.)

To Apple 'Steyne Seedling' (votes, unanimous), from Lady Thornycroft, Bembridge, Isle of Wight. Fruit of medium size, and beautiful even shape; eye closed, with erect segments, in a shallow puckered basin; stalk ¾ inch long, thin and deeply inserted in a rather russet cavity; skin pale yellow, suffused with pale red and russet on the exposed side; flesh white, crisp, sweet, and very juicy, with a decided 'Cox's Orange' flavour. The tree is stated to be a good grower and free bearer. An excellent dessert variety.

To Apple 'Winter Banana' (votes, unanimous), from the Agent-General for British Columbia. Fruit large, slightly ribbed; eye closed, set in a wide shallow basin; segments closed; stalk thin, 1 inch long, deeply inserted in a wide, deep, and even cavity; skin pale yellow, with a pinkish-red colour on the exposed side; flesh white, soft, very juicy,

and of delicious flavour. Although this variety is such a very good dessert apple in British Columbia it remains to be proved if it will be a success when grown in this country.

Other Exhibit.

Mr. H. Fletcher, Annesley: Apple 'Florrie Fletcher.'

FRUIT AND VEGETABLE COMMITTEE, DECEMBER 17, 1912.

Mr. J. CHEAL in the Chair, and five members present.

No exhibits were before the Committee on this occasion.

FLORAL COMMITTEE.

SEPTEMBER 10, 1912.

Mr. H. B. MAY, V.M.H., in the Chair, and nineteen members present.

Awards Recommended :—

Silver-gilt Flora Medal.

To Mr. J. Box, Lindfield, for hardy plants.
To Messrs. Carter Page, London, for Dahlias and Violas.

Silver-gilt Banksian Medal.

To Messrs. Hobbies, Dereham, for Dahlias.
To Mr. A. Perry, Enfield, for hardy plants.

Silver Flora Medal.

To Messrs. Cannell, Swanley, for Dahlias.
To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Cheal, Crawley, for trees and shrubs.
To Messrs. Felton, London, for Nelumbiums.
To Messrs. Gunn, Olton, for Phloxes.
To Messrs. W. Paul, Waltham Cross, for Roses.

Silver Banksian Medal.

To Miss M. Walters Anson, Streatham, for painting of Nelumbium.
To Messrs. Barr, Taplow, for hardy plants.
To Messrs. Bunyard, Maidstone, for hardy plants.
To Messrs. Cutbush, Highgate, for Dracaenas.
To Mr. A. Ll. Gwillim, Sidcup, for Begonias, &c.
To Messrs. May, Upper Edmonton, for Ferns and Veronicas.
To Mr. S. Mortimer, Farnham, for Dahlias.
To Mr. L. R. Russell, Richmond, for flowering plants.
To Mr. C. Turner, Slough, for Dahlias.
To Messrs. Ware, Feltham, for Dahlias, Asters, &c.

Bronze Flora Medal.

To Mr. J. T. West, Brentwood, for Dahlias.

Award of Merit.

To *Achillea Ptarmica* 'Perry's White' (votes, 14 for, 2 against), from Mr. A. Perry, Enfield. A charming hardy plant bearing large numbers of pure white double flowers, which are larger in size than those of the well known *A. Ptarmica* 'The Pearl.' It grows about 2 or 3 feet high, and blooms late in the season. (Fig. 193.)

To Chrysanthemum 'Crimson Polly' (votes, 15 for), from

FIG. 194.—KNIPHOFIA 'JOHN BENARY.' (*Gard. Chron.*) (p. ccxlix.)

[*To face p.* ccxlvi.

Fig. 195.—H.T. Rose 'Edward Bohane.' (*Garden.*) (p. ccl.)

Fig. 196.—Hoheria populnea. (*Garden.*) (p. cclvi.)

Messrs. Wells, Merstham. A good early flowering variety of dark crimson colour, with gold reverse to the petals It is a sport from 'Polly.'

To Dahlia 'Albert Maumène' (votes, 8 for, 2 against), from Mr. J. B. Riding, Chingford. A large flower of the 'Collarette' type, with crimson petals. The centre is surrounded by a ring of rather long, whitish florets.

To Dahlia 'Crawley Star' (votes, unanimous), from Messrs. Cheal, Crawley. This variety was originally shown as an 'Anemone-flowered' Dahlia, but this name being considered inappropriate, the name 'Cosmea' type was substituted. It is a distinct novelty, and of great value for garden decoration. The flowers are 4 inches across, deep rosy pink in colour, becoming crimson at the extreme base of the petals. The centre is golden yellow, and around it the broad pointed petals are symmetrically arranged. Stems rigid.

To Dahlia 'Dolly' (votes, 10 for), from Messrs. Stredwick, St. Leonards-on-Sea. A 'Cactus' variety of good form. Colour, crimson-scarlet, tipped with creamy white.

To Dahlia 'Ideal' (votes, 8 for, 1 against), from Mr. J. B. Riding, Chingford. A pretty 'Collarette' Dahlia of medium size. The colour is deep scarlet, with a ring of small, deep yellow florets surrounding the centre.

To Dahlia 'John Riding' (votes, 8 for), from Messrs. Stredwick, St. Leonards-on-Sea. A beautiful 'Cactus' variety of medium size, with long incurving florets. Colour, crimson, shaded with orange.

To Dahlia 'Nantwich' (votes, 7 for), from Messrs. Stredwick, St. Leonards-on-Sea. A medium sized 'Cactus' Dahlia of a lovely orange shade, tinged with fawn.

To Dahlia 'Papa Charmet' (votes, 6 for), from Messrs. Hobbies, Dereham. An excellent, large, dark crimson 'Decorative' Dahlia.

To Dahlia 'Queen Mary' (votes, 5 for, 2 against), from Messrs. Cannell, Swanley. A lovely rose-pink 'Garden Decorative' variety of excellent form and good shape.

To Dahlia 'Selma' (votes, 6 for), from Mr. C. Turner, Slough. A charming 'Pompon' variety of perfect form and of an orange-buff colour shaded with pink.

To *Helenium autumnale rubrum* (votes, 15 for, 1 against), from Mr. A. Perry, Enfield. A most useful autumn flowering herbaceous perennial of very free blooming habit. The flowers are large, and of a dark reddish-orange colour.

To Pentstemon 'Gaddesden Gem' (votes, 15 for, 3 against), from Mr. A. G. Gentle, Little Gaddesden. A very free-flowering and vigorous growing variety, with large crimson flowers having the corolla white inside.

To Phlox 'Rynstroom' (votes, 17 for, 1 against), from Mr. J. Box, Lindfield. A charming Phlox of a very deep pink colour. The individual flowers are large, and numerous lateral trusses are

produced which make the plant very effective. The foliage is exceptionally large, and the plant is said to be a strong grower.

Other Exhibits.

Mr. H. R. Barrett, Barford St. Michael: Carnations and Marigolds.

Messrs. Bide, Farnham: Sweet Peas, &c.

Messrs. Brown, Peterborough: hardy plants.

Messrs. Burrell, Cambridge: Dahlias.

Messrs. Clark, Dover: hardy plants.

Mr. L. N. Davidson, Twyford: Dahlias.

Mr. E. Dixon, Putney: hardy plants.

Messrs. Fells, Hitchin: rock plants.

Misses Hopkins, Shepperton: hardy plants.

Mr. J. Howard, Liscard: Rose.

Messrs. Jones, Lewisham; Chrysanthemums and Pelargoniums.

Messrs. S. Low, Enfield: Carnations.

Rev. C. Lunn, Rugby: Aster 'Frankton.'

Misses Price & Fyfe, Lee: Chrysanthemums, &c.

Mr. G. Reuthe, Keston: hardy plants.

Mr. H. Shoesmith, Woking: Dahlias.

Messrs. R. Veitch, Exeter: Aster 'Elegance.'

Messrs. Whitelegg & Page, Chislehurst: hardy plants.

FLORAL COMMITTEE, SEPTEMBER 24, 1912.

Mr. H. B. MAY, V.M.H., in the Chair, and twenty-six members present.

Awards Recommended :—

Silver-gilt Banksian Medal.

To Messrs. B. R. Cant, Colchester, for Roses.

To Messrs. F. Cant, Colchester, for Roses.

To Messrs. A. Dickson, Newtownards, for Roses.

To Messrs. Dobbie, Edinburgh, for Scabious and Sweet Peas.

To Messrs. W. Paul, Waltham Cross, for Roses.

Silver Flora Medal.

To Mr. J. Box, Lindfield, for hardy plants.

To Messrs. Cheal, Crawley, for Dahlias.

To Messrs. May, Upper Edmonton, for Ferns.

To Messrs. J. Veitch, Chelsea, for greenhouse plants.

Silver Banksian Medal.

To Messrs. Cutbush, Highgate, for Carnations and Roses.

To Messrs. Jones, Lewisham, for Michaelmas Daisies.

To Mary Countess of Ilchester (gr., Mr. Dixon), Kensington, for *Crataegus* species.

To Messrs. Carter Page, London, for Dahlias, Antirrhinums, &c.

To Messrs. G. Paul, Cheshunt, for cut shrubs.
To Messrs. Piper, Bayswater, for rock plants and autumn foliage.
To Mr. J. B. Riding, Chingford, for Dahlias.
To Mr. C. Turner, Slough, for Dahlias.
To Messrs. Wallace, Colchester, for hardy plants.
To Messrs. Wells, Merstham, for Chrysanthemums.
To Mr. J. T. West, Brentwood, for Dahlias.

Bronze Flora Medal.

To Messrs. Proctor, Chesterfield, for Roses.

Bronze Banksian Medal.

To Messrs. Jarman, Chard, for Sweet Peas.
To Messrs. Stuart Low, Enfield, for Carnations.
To Misses Price & Fyfe, Lee, for Chrysanthemums, &c.
To Messrs. Ware, Feltham, for Dahlias, &c.

Award of Merit.

To Chrysanthemum 'Framfield Early White' (votes, 9 for, 3 against), from Mr. N. Davis, Framfield. An excellent early flowering variety, with pure white globular flowers measuring 4½ inches across. It is said to be of dwarf habit.

To Chrysanthemum 'Joan Carter' (votes, 13 for), from Messrs. Wells, Merstham. A very free flowering, deep yellow, single variety of medium size. It grows about 18 inches high, and is of bushy habit.

To Dahlia 'Jenny Wren' (votes, unanimous), from Messrs. Stredwick, St. Leonards-on-Sea. An excellent 'Garden Cactus' variety, with strong, stiff stems. The colour is pale yellow, deeply suffused with rose. The centre is deep yellow. The Committee considered this to be a good type of Dahlia for garden decoration.

To Dahlia 'Johnny' (votes, 8 for), from Mr. J. T. West, Brentwood. A deep dull crimson 'Pompon' variety of perfect shape.

To Dahlia 'Mrs. Randle' (votes, 8 for, 1 against), from Messrs. Stredwick, St. Leonards-on-Sea. A large rosy-pink 'Cactus' Dahlia, with a deep yellow centre, and slightly twisted florets.

To Dahlia 'Useful' (votes, 11 for), from Mr. J. T. West, Brentwood. This variety is classed as a 'Decorative' Dahlia, and has bright rosy-pink flowers, measuring 3½ inches across, of good form, borne on good, stiff stems.

To Kniphofia 'John Benary' (votes, unanimous), from Messrs. J. Veitch, Chelsea. This variety is synonymous with that known as 'Lord Roberts.' It is very handsome and effective, and bears freely large spikes of bright fiery-red flowers, with no trace of yellow. The leaves are long and narrow, and the height of the plant is about 5 feet. (Fig. 194.)

To Pentstemon 'Mrs. F. Fulford' (votes, unanimous), from Mr. F. Fulford, Montgomerie Castle Gardens, Tarbolton. A very handsome and exceptionally free-flowering variety, with large flowers of

a dark strawberry-red colour. The inside of the corolla is whitish, and the plant is apparently a strong grower.

To Rose 'Edward Bohane' (votes, 13 for, 2 against), from Messrs. A. Dickson, Newtownards, Ireland. A charming bright crimson H.T. variety of good substance. It is of large size, and has a great number of petals, but little or no fragrance. (Fig. 195.)

To Rose 'George Dickson' (votes, 19 for, 1 against), from Messrs. A. Dickson, Newtownards, Ireland. This is one of the most perfect and beautiful H.T. roses of recent introduction. The flowers are large and of excellent form. The colour is deep velvety crimson, and the tips of the deep petals are prettily reflexed. One of the most pleasing features of this charming flower is its rich perfume.

To Rose 'Little Dorrit' (votes, unanimous), from Messrs. G. Paul, Cheshunt. A charming Tea rose of an exquisite rosy-peach colour, with shadings of buff and salmon. It is of medium size, and slightly fragrant. It is said to be a good bedding variety, almost mildew proof, and a constant bloomer.

To Rose 'Mrs. Mackellar' (votes, unanimous), from Messrs. A. Dickson, Newtownards, Ireland. Another new seedling H.T. variety of large size and good substance. The colour is pale sulphur-yellow, and the perfume is pleasing though slight. (Fig. 197.)

Other Exhibits.

Messrs. Allwood, Haywards Heath: Carnation 'Rosetty.'

Mr. P. Anthos, London: Gerberas.

W. Baker-Gabb, Esq., Abergavenny: seedling Campanula.

Messrs. Bakers, Codsall: Dahlias.

Messrs. Barr, Covent Garden: hardy plants.

Messrs. Bath, Wisbech: Chrysanthemums.

Messrs. Bunyard, Maidstone: Asters.

Messrs. Cannell, Swanley: hardy plants and Cannas.

Messrs. Clark, Dover: hardy plants.

Mr. E. Dixon, Putney: hardy plants.

Mr. W. Easlea, Eastwood: Dahlia 'Florrie.'

Mr. J. Fielding, Leeds: Chrysanthemum 'Mrs. J. Fielding.'

Hon. Vicary Gibbs, Elstree: Aster 'White Queen.'

Mr. C. Griffin, Frimley: double *Primula kewensis*.

Misses Hopkins, Shepperton: hardy plants.

Mr. W. E. Ingwersen, Croydon: Asters.

Mr. H. Nye, South Lancing: Pelargoniums.

Mr. A. Perry, Enfield: Asters.

Mr. E. Potten, Cranbrook: Asters.

Mr. L. R. Russell, Richmond: flowering plants.

Mr. H. Shoesmith, Woking: Dahlias.

Mr. W. Stacey, Dunmow: Dahlia 'Stacey's White.'

Messrs. Thompson & Charman, Bushey: *Geum Borisii* and *Saxifraga Brunoniana*.

LOPENDRIUM CRISPUM NOBILE. (*Cranfield.*) (p. ccliii.)

Messrs. R. Veitch, Exeter: Nerines and choice shrubs.
Wargrave Plant Farm, London: Aster 'Viscount Garnault.'
Earl of Warwick, Dunmow: Petunia 'Countess of Warwick.'

Floral Committee, October 8, 1912.

Mr. H. B. May, V.M.H., in the Chair, and seventeen members present.

Awards Recommended :—

Gold Medal.

To Messrs. Veitch, Chelsea, for a collection of choice evergreen and deciduous shrubs and berried plants, including new Chinese introductions.

Silver Flora Medal.

To Mr. J. Box, Lindfield, for hardy plants.
To Messrs. Brown, Peterborough, for Roses.
To Messrs. B. R. Cant, Colchester, for Roses.
To Messrs. Cutbush, Highgate, for Asters, Carnations, &c.
To the Countess Grey, Park Lane, for a collection of South African Heaths.
To Messrs. Hill, Lower Edmonton, for Ferns.
To Mr. L. R. Russell, Richmond, for Bamboos.

Silver Banksian Medal.

To Messrs. Barr, Taplow, for hardy plants.
To Messrs. F. Cant, Colchester, for Roses.
To Messrs. Dobbie, Edinburgh, for Dahlias.
To Messrs. Jackman, Woking, for Roses and other hardy plants.
To Messrs. Jones, Lewisham, for Asters, &c.
To Mr. F. Lilley, Guernsey, for Nerines.
To Messrs. S. Low, Enfield, for Carnations.
To Messrs. May, Upper Edmonton, for Ferns.
To Messrs. W. Paul, Waltham Cross, for Roses.
To Messrs. Ware, Feltham, for Begonias and hardy plants.
To Messrs. Wells, Merstham, for Chrysanthemums.
To Mr. J. T. West, Brentwood, for Dahlias.

Bronze Banksian Medal.

To Messrs. Cannell, Swanley, for Pelargoniums.

Award of Merit.

To *Adiantum cuneatum micropinnulum* (votes, unanimous), from Messrs. May, Upper Edmonton. A charming sport from *A. cuneatum gracillimum* having very small pinnules. The fronds have a nice drooping habit, and are prettily tinged with bronze when young. (Fig. 199.)

To Aster 'Nancy Ballard' (votes, unanimous), from Mr. E.

Ballard, Colwall, nr. Malvern. This excellent Michaelmas Daisy has double flowers similar in form to those of the well-known variety 'Beauty of Colwall.' They are of a lovely pale violet-purple colour, and measure $1\frac{1}{4}$ inch across. The plant is of a nice bushy and erect habit, and produces its flowers in great profusion.

To *Berberis Stapfiana* (votes, 10 for), from Messrs. J. Veitch, Chelsea. A new hardy species from China named in compliment to Dr. O. Stapf, the keeper of the Kew Herbarium. The specimen exhibited was a dense spiny bush having small ovate leaves and an abundance of small currant-red berries, borne in clusters.

To Chrysanthemum 'Celia' (votes, 8 for, 2 against), from Messrs. Cragg, Harrison & Cragg, Heston. A useful deep golden-yellow single variety measuring 4 inches across. It has several rows of ray florets and a greenish disc. The flowers are borne on good strong stems.

To Chrysanthemum 'Mrs. Lloyd Wigg' (votes, unanimous), from Messrs. Wells, Merstham. A very large Japanese variety of a good clear yellow colour. The blooms measure from 10 to 12 inches across. The plant is said to be a good grower.

To *Cotoneaster bullata* (votes, 11 for), from Messrs. J. Veitch, Chelsea. A new hardy species from China having dark green ovate leaves and producing an abundance of glossy dark berries borne in stalked pendent clusters. It is a strong-growing shrub of loose, open habit.

To *Cotoneaster salicifolia rugosa* (votes, unanimous), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Aldenham House, Elstree. A very handsome Chinese shrub having long pendulous branches covered with much-wrinkled lanceolate leaves which have the under surface covered with down. The berries are small, globular, and bright scarlet. They are borne in clusters and, combined with the autumn tints of the foliage, produce a very pretty effect.

To *Cotoneaster Zabelii* (votes, 9 for, 3 against), from Hon. Vicary Gibbs (gr. Mr. E. Beckett, V.M.H.), Aldenham House, Elstree. Another handsome tree from China, of vigorous growth and graceful habit. The medium-sized, ovate leaves are downy beneath, and assume a very pretty autumn tint. The branches are long and arching, and carry numerous clusters of large, dull, crimson berries which are flattened at the top.

To *Pyrus Veitchiana* (votes, 12 for), from Messrs. J. Veitch, Chelsea. A new hardy species introduced from China by Mr. E. H. Wilson, V.M.H. It forms a very handsome tree with spreading branches. The leaves are broadly ovate, dull green, and finely toothed. The abundant clusters of dull crimson, globular, speckled berries render the tree very decorative, and it is said to be very pretty when in flower.

Other Exhibits.

Messrs. Allwood, Haywards Heath: Carnations.
Messrs. Clark, Dover: hardy plants.

S. Cunningham, Esq., Belfast: Glencairn Laurel.
Mr. E. Dixon, Putney: hardy plants.
Messrs. Fells, Hitchin: hardy plants.
Mr. L. Greening, Richmond Hill: rock and water garden.
Misses Hopkins, Shepperton: hardy plants.
Mr. W. E. Ingwersen, South Croydon: Asters.
Mr. F. Johnson, Camberley: Chrysanthemum 'Rossie.'
Mr. J. Love, Westbury-on-Trym: Galegas.
Messrs. Carter Page, London Wall: Violas and Asters.
Messrs. Peed, Norwood: Chrysanthemums.
Misses Price & Fyfe, Lee: Chrysanthemums.
Mr. R. Prichard, West Moors: Hardy plants.
Mr. G. Reuthe, Keston: Hardy plants.

Floral Committee, October 22, 1912.

Mr. H. B. May, V.M.H., in the Chair, and twenty-six members present.

Awards Recommended:—

Gold Medal.

To Mr. L. R. Russell, Richmond, for Ivies and berried shrubs.
To Messrs. J. Veitch, Chelsea, for stove and greenhouse plants.

Silver-gilt Banksian Medal.

To Messrs. S. Low, Bush Hill Park, for Carnations and greenhouse plants.

Silver Flora Medal.

To Messrs. May, Upper Edmonton, for flowering plants and ferns.
To Messrs. Wells, Merstham, for Chrysanthemums.

Silver Banksian Medal.

To Messrs. Cannell, Swanley, for succulents.
To Messrs. Cragg, Harrison & Cragg, Heston, for Chrysanthemums.
To Messrs. Cutbush, Highgate, for Carnations and Roses.
To Messrs. Young, Cheltenham, for Carnations.

Bronze Flora Medal.

To Misses Price & Fyfe, Lee, for Chrysanthemums and Carnations.
To Messrs. Ware, Feltham, for alpines.

Bronze Banksian Medal.

To Mr. Purnell, Streatham Hill, for stove and greenhouse plants.
To Mrs. Percy Westmacott (gr. Mr. G. Gumbrell), Ascot, for Begonias.

First-class Certificate.

To *Phyllitis Scolopendrium crispum nobile* (votes, unanimous), from W. B. Cranfield, Esq., Enfield Chase, Middlesex. A remarkable

and very robust hardy fern, collected on Warton Crag, Lancashire. It has beautifully crinkled and crested fronds, measuring 2 feet long and 6 inches wide at the broadest part. (Fig. 198.)

Award of Merit.

To Chrysanthemum 'Charles Kingsley' (votes, unanimous), from Mr. Norman Davis, Framfield. A good deep yellow single variety, measuring 4 inches across.

To Chrysanthemum 'Hon. Mrs. John Ward' (votes, 15 for, 1 against), from Mr. Charles Beckett, Hungerford. A large pale yellow Japanese variety, measuring 7 inches across. It is a sport from 'White Queen.'

To Chrysanthemum 'J. W. Streeter' (votes, 16 for), from Messrs. Cragg, Harrison & Cragg, Heston. A pale yellow incurved variety of good substance, measuring 4 inches across. It is a sport from 'H. W. Thorpe,' and is said to be a very free grower.

To Chrysanthemum 'Miss M. Borrer' (votes, 13 for, 1 against), from L. F. Harrison, Esq. (gr. Mr. A. H. Chapman), Orchards, East Grinstead. A charming violet-rose single variety, measuring 3½ inches across. It has a prominent golden yellow eye and the rose colour becomes lighter at the base of the florets.

To Chrysanthemum 'Mrs. John Maher' (votes, 11 for, 1 against), from Mr. T. Page, Hampton. A pretty white decorative variety with reflexed florets. The flowers are 5 inches across and are borne on good stiff stems.

To Chrysanthemum 'Mrs. Loo Thomson' (votes, 13 for, 4 against), from Mr. Norman Davis, Framfield. A pale amber-yellow single variety, measuring 4½ inches across. It is a sport from 'Mensa,' and has a greenish centre.

To Chrysanthemum 'Bob Pulling' (votes, unanimous), from Messrs. H. J. Jones, Lewisham. A magnificent rich yellow Japanese variety, measuring 7 inches across. The broad reflexed florets are incurved at the tip. It is a good exhibition variety.

To *Nephrolepis Millsii* (votes, 10 for, 4 against), from Mr. W. A. Manda, St. Albans. A valuable decorative fern with pretty pale green bipinnate fronds. It is said to require very little heat and to withstand rough treatment with comparatively small injury.

Other Exhibits.

Messrs. Allwood, Haywards Heath: Carnations.

Messrs. Bide, Farnham: Begonias.

Lieut.-Colonel Stephenson Clarke, Cuckfield: *Delphinium macrocentron.*

Mr. L. Greening, Richmond Hill: rock and water garden.

Lieut.-Colonel Sir G. Holford, K.C.V.O., C.I.E. (gr. Mr. Chapman), Tetbury: hybrid *Rhododendron javanicum* bearing two distinct coloured trusses of flowers.

Misses Hopkins, Shepperton: hardy plants.

Mr. P. Ladds, Swanley Junction: Crotons.

Fig. 199.—Adiantum cuneatum micropinnulum. (*May.*) (p. ccli.)

FIG. 200.—CARNATION 'ST. NICHOLAS.' (*Low.*) (p. cclv.)

[*To face p. cclv.*

Mr. G. Mileham, Leatherhead: Chrysanthemums.
Mrs. R. Powys-Lybbe, Streatley-on-Thames: Chrysanthemums.
Mr. G. Prince, Longworth: Roses.
Mr. M. Silsbury, Shanklin: Chrysanthemums.
Messrs. Whitelegg & Page, Cheltenham: Asters.

Floral Committee, November 5, 1912.

Mr. H. B. May, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended:—

Silver-gilt Banksian Medal.

To Messrs. J. Veitch, Chelsea, for Begonias and Chrysanthemums.

Silver Flora Medal.

To Mr. L. R. Russell, Richmond, for Bertolonias and Sonerilas.

Silver Banksian Medal.

To Messrs. Cutbush, Highgate, for Begonias.
To Messrs. May, Upper Edmonton, for ferns.

Award of Merit.

To Begonia 'Emita' (votes, unanimous), from Messrs. J. Veitch, Chelsea. A charming variety of quite a new type, obtained as the result of a cross between *B. socotrana* ♂ and a single orange-scarlet variety ♀. The single flowers are borne in great profusion, and measure $2\frac{1}{2}$ inches across. The colour is a rich orange shade tinged with deep rose-pink. The plant is a vigorous grower and has handsome dark green foliage.

To Begonia 'Optima' (votes, 13 for, 2 against), from Messrs. J. Veitch, Chelsea. Another most beautiful variety, obtained as the result of crossing *B. socotrana* ♂ and *B. Pearcei* seedling ♀. The flowers, which are single and about the same size as those of 'Emita,' are rose-pink tinged with salmon. They are loosely borne, and the pretty combination of colours is very effective. The plant is a strong grower, a profuse bloomer, and has handsome foliage.

To Carnation 'St. Nicholas' (votes, unanimous), from Messrs. Stuart Low, Bush Hill Park. A large scarlet perpetual flowering variety of perfect form, with a good non-splitting calyx and a slight perfume. (Fig. 200.)

To Chrysanthemum 'Hector Menzies' (votes, 16 for), from Messrs. H. J. Jones, Lewisham. A useful bright lemon-yellow single variety, measuring 4 inches across and having good stiff stems.

To Chrysanthemum 'Miss A. E. Roope' (votes, 17 for), from Messrs. H. J. Jones, Lewisham. A very large incurved Japanese variety, with broad curled florets of a deep yellow colour. It is a seedling from Chrysanthemum 'Hon. Mrs. Lopes.'

To Chrysanthemum 'Mr. Leonard Harrison' (votes, 10 for, 2 against), from L. F. Harrison, Esq. (gr. Mr. A. H. Chapman), East

Grinstead. A pretty chestnut-red single variety, measuring about 4 inches across. The florets are broad and have a pale terra-cotta reverse. A narrow ring of yellow surrounds the centre.

To Chrysanthemum 'Portia' (votes, 14 for), from Messrs. Cragg, Harrison & Cragg, Heston. A very pretty terra-cotta single variety, measuring $4\frac{1}{2}$ inches across. The florets are very stiff, quilled, and have a buff reverse. The centre is golden-yellow.

To Chrysanthemum 'Queen Mary' (votes, unanimous), from Messrs. Wells, Merstham. A large incurved Japanese variety of perfect form. The blooms are creamy white in colour and measure 9 inches across.

To Chrysanthemum 'Snow Queen' (votes, 19 for), from Messrs. Cragg, Harrison & Cragg, Heston. A charming single of purest white. It belongs to the anemone-flowered section, and has a white centre, measuring 1 inch across, and composed of numerous, closely packed, small florets. The blooms measure 4 inches across and are borne on very stiff erect stems suitable for cutting.

To *Hoheria populnea* (votes, 15 for), from Mary Countess of Ilchester (gr. Mr. H. Kempshall), Abbotsbury Castle, Dorsetshire A pretty flowering shrub belonging to the Malvaceae. It is a native of New Zealand and has proved hardy at Abbotsbury. The flowers are small, pure white, having 5 petals, and are borne in bunches of 3-7 in the axils of the lanceolate, serrate, dark leaves. (Fig. 196.)

To *Nephrolepis exaltata Willmottiae* (votes, 14 for, 2 against), from Messrs. May, Upper Edmonton. A remarkable fern, having very finely divided, densely plumose fronds. It is more mossy-like than *N. exaltata Marshallii compacta.*

Other Exhibits.

Messrs. Allwood, Haywards Heath: Carnations.

Messrs. Blackmore & Langdon, Bath: Begonias.

Mr. F. Brazier, Caterham: Chrysanthemum 'Caterham Bronze.'

Messrs. Clibran, Altrincham: Begonia 'Clibran's Perfection.'

Mr. A. Gooding, Chichester: Chrysanthemums.

Mr. P. Healey, Lytham: Carnations.

Misses Hopkins, Shepperton: hardy plants.

Mr. F. Johnson, Camberley: Chrysanthemums.

Mr. P. Ladds, Swanley Junction: Chrysanthemums.

C. Lazenby, Esq., Beckenham: Chrysanthemum 'Mrs. Charles Lazenby.'

Mr. G. Reuthe, Keston: Nerines, &c.

Viscount Ridley (gr. Mr. F. Perry), Cramlington: Carnations.

Mr. S. C. Smail, Dunstable: Chrysanthemum 'Doris Smail.'

Lieut.-Col. Hon. H. F. Trefusis (gr. Mr. A. J. Morgan), Devoran: Violets.

Mrs. Twentyman (gr. Mr. W. Lockyer), New Barnet: Chrysanthemum 'Green Hill Gem.'

Floral Committee, November 19, 1912.

Mr. H. B. May, V.M.H., in the Chair, and twenty-one members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. J. Waterer, Bagshot, for mixed evergreens, Conifers, Yews, Hollies, &c.

To Messrs. Wells, Merstham, for Chrysanthemums.

Silver Flora Medal.

To F. Galsworthy, Esq., Chertsey, for paintings.

To Messrs. Jones, Lewisham, for Chrysanthemums.

To Messrs. J. Veitch, Chelsea, for Begonias and Chrysanthemums.

Silver Banksian Medal.

To Mr. J. Box, Haywards Heath, for Chrysanthemums.

To Messrs. Clibran, Altrincham, for Begonias.

To Messrs. Cutbush, Highgate, for Carnations and miscellaneous greenhouse plants.

To Messrs. May, Upper Edmonton, for Cyclamen, &c.

Award of Merit.

To Begonia 'Eclipse' (votes, 10 for, 1 against), from Messrs. Clibran, Altrincham. A beautiful hybrid winter-flowering Begonia obtained with the three following novelties as the results of crosses between *B. socotrana* and tuberous varieties. The flowers are medium sized, semi-double, and of a charming reddish-salmon colour. They are borne in great profusion in elegant arching sprays, and form a pleasing contrast with the handsome dark-green leaves. (Fig. 201.)

To Begonia 'Lucy Clibran' (votes, 11 for, 1 against), from Messrs. Clibran, Altrincham. The flowers of this variety are semi-double, and measure 3 inches in diameter. They are of a lovely pink colour, shaded with salmon and orange, and are borne in long arching sprays. The foliage is large and dark-green in colour.

To Begonia 'Scarlet Beauty' (votes, 11 for), from Messrs. Clibran, Altrincham. Another highly decorative variety having bright scarlet semi-double flowers, measuring 2 inches across. The blooms are very freely produced, and are borne in large loose trusses. (Fig. 202.)

To Begonia 'Splendour' (votes, unanimous), from Messrs. Clibran, Altrincham. A very free-flowering variety, having scarlet semi-double blooms, and handsome dark-green foliage.

To Carnation 'Mary Allwood' (votes, 12 for, 1 against), from Messrs. Allwood, Haywards Heath. A charming new seedling perpetual-flowering variety, having very full, light-salmon rose flowers with smooth petals, fine strong stems, and a good calyx. The flowers have a pleasing fragrance. (Fig. 203.)

To Carnation 'Salmon Enchantress' (votes, 12 for), from Messrs.

Allwood, Haywards Heath. This is a sport from the well-known and very popular variety 'Enchantress.' The flowers are very large, of perfect form, and of a deep salmon-pink colour.

To Carnation 'Snowstorm' (votes, unanimous), from Mr. W. Lawrenson, Yarm-on-Tees. This is undoubtedly one of the finest white perpetual-flowering Carnations yet raised. The flowers are very large and full, and are supported on strong wiry stems of great length. The calyx is perfect, and the strong clove scent is one of the most pleasing features of this charming flower. It is evidently a very strong grower, and should prove very useful for market work.

To Chrysanthemum 'Audrey' (votes, 8 for, 3 against), from Manor House Nurseries, Cardiff. A single variety having two or three rows of bright yellow ray florets. The flowers measure 4½ inches across, and are borne on good stiff stems.

To Chrysanthemum 'Michael Harrison' (votes, 13 for), from L. F. Harrison, Esq. (gr. Mr. A. H. Chapman), Orchards, East Grinstead. A large single variety of good substance with three or four rows of ray florets. The colour is a light reddish-brown, with a band of yellow round the centre. The blooms measure 4 inches across.

To Chrysanthemum 'Miss May Fox' (votes, 9 for), from Messrs. Jones, Lewisham. A large Japanese variety, with long, drooping, reflexed ray florets of medium width, and of a creamy-white colour. The flowers have a greenish centre.

To Chrysanthemum 'Mrs. W. T. Smith' (votes, 11 for), from Mr. A. Smith, Convent Gardens, Roehampton Lane, S.W. A seedling Japanese variety of large size, with pure white incurved florets. The blooms measure 7 inches across.

Other Exhibits.

Messrs. Barrie & Brown, London: Alpines.

Mrs. Bergheim (gr. Mr. Page), Hampstead: *Drosophyllum lusitanicum*, B.C. 1875.

Mr. W. H. Berry, Gloucester: Chrysanthemum 'W. H. Berry.'

Messrs. Cannell, Swanley: Chrysanthemums.

Messrs. Cragg, Harrison & Cragg, Heston: Chrysanthemums.

Miss di Guardi: paintings.

Mr. C. Engelmann, Saffron Walden: Carnations.

Sir George Faudel-Phillips, G.C.I.E. (gr. Mr. Fitch), Hertford: *Plumbago coccinea.*

G. Ferguson, Esq. (gr. Mr. Smith), Weybridge: Chrysanthemum 'Edna Deane.'

Miss Fisher, East Molesey: paintings.

Hon. Vicary Gibbs (gr. Mr. Beckett), Aldenham, Elstree: Streptocarpus, 'Aldenham' strain.

Messrs. Godfrey, Exmouth: Chrysanthemum 'Mollie Godfrey.'

Misses Hopkins, Shepperton: hardy plants.

Mr. J. J. Kettle, Corfe Mullen: Violet 'Mrs. J. J. Kettle.'

Messrs. S. Low, Enfield: Carnations.

FIG. 201.—BEGONIA 'ECLIPSE.' (*Clibran.*) (p. cclvii.)

Fig. 204.—Prunus Miqueliana. (*Gard. Chron*) (p. cclx.)

Fig. 205.—Carnation 'Benora.' (*Low.*) (p. celxi.)

Fig. 206. Dendrobium Schützei (*Sander.*) (p. cclxii.)

Herrn Paul Lutz, Scharlachberg, Germany: *Asparagus Lutzii.*

Countess of Macclesfield, Watlington: Chrysanthemum 'Countess of Macclesfield.'

Mr. W. A. Manda, St. Albans: ferns.

W. Marshall, Esq., V.M.H., Bexley: *Nephrolepis todeaoides* reverting.

Miss B. Malone, Chelsea: paintings.

Mr. A. Munday, Battle: Chrysanthemum seedling.

Mrs. Norman (gr. Mr. Bentley), Much Hadham: Carnation 'Mrs. Frederick Norman.'

Miss Ough, Streatham Common: paintings.

Rev. F. Page-Roberts, Mortimer: *Sidalcea* seedling.

Messrs. Peed, West Norwood: Chrysanthemums.

Mr. W. Perry, Bagshot: Chrysanthemum 'Mary Perry.'

Messrs. Piper, Bayswater: Saxifrages.

Misses Price and Fyfe, Lee: Carnations and Chrysanthemums.

Mr. G. Reuthe, Keston: Himalayan Rhododendrons.

Mr. L. R. Russell, Richmond: miscellaneous plants.

Mr. T. Ward, Bishop Stortford: Chrysanthemums.

Messrs. Ware, Feltham: alpines.

Miss E. Warrington, Streatham Common: paintings.

Messrs. Whitelegg & Page, Chislehurst: alpines.

Floral Committee, December 3, 1912.

Mr. H. B. May, V.M.H., in the Chair, and twenty-five members present.

Awards Recommended:—

Gold Medal.

To Mr. C. Engelmann, Saffron Walden, for Carnations.

Silver-gilt Flora Medal.

To M. H. Burnett, Guernsey, for Carnations.

Silver-gilt Banksian Medal.

To Messrs. Cutbush, Highgate, for Carnations and greenhouse plants.

Silver Flora Medal.

To Mr. G. Lange, Hampton, for Begonias, Hydrangeas, and Carnations.

To Colonel Lockwood (gr. Mr. G. Cradduck), Romford, for Chrysanthemums.

To Messrs. S. Low, Bush Hill Park, for Carnations.

To Mr. L. R. Russell, Richmond, for Azaleas, &c.

To Messrs. J. Veitch, Chelsea, for Begonias.

Silver Banksian Medal.

To Messrs. Allwood, Hayward's Heath, for Carnations.

To Rev. H. Buckston (gr. Mr. A. Shambrook), Derby, for Cyclamen.

To Mr. W. Lawrenson, Yarm, for Carnations.

To Messrs. Ware, Feltham, for alpines.

To Messrs. Wells, Merstham, for Carnations and Chrysanthemums.

To Messrs. Young, Cheltenham, for Carnations.

Bronze Flora Medal.

To Messrs. May, Upper Edmonton, for ferns and flowering plants.

Award of Merit.

To *Asplenium divaricatum elegans* (votes, unanimous), from Messrs. Parker, Whetstone. A useful decorative fern of light and graceful habit, with finely cut arching fronds of a pale-green colour.

To Carnation 'Bonfire' (votes, unanimous), from Messrs. Wells, Merstham. A bright scarlet, perpetual-flowering variety of perfect shape and medium size. The petals are prettily serrated and the flowers have a slight perfume. The bright colour renders this variety particularly useful for decorative work.

To Carnation 'Mrs. A. F. Dutton' (votes, 10 for, 3 against), from Mr. A. F. Dutton, Iver. A charming perpetual-flowering variety of large size, with crinkled petals. It originated as a sport from 'White Perfection.' The colour is a delightful shade of bright rose.

To Chrysanthemum 'Eric Wild' (votes, 16 for, 2 against), from Messrs. Wells, Merstham. A very pale rose-pink single variety, with a ring of white surrounding the centre. The flowers measure 4 inches across.

To Chrysanthemum 'Miss A. Brooker' (votes, unanimous), from Messrs. J. Veitch, Chelsea, and Messrs. Wells, Merstham. A very useful decorative variety, with flowers measuring 6 inches across, borne on stiff stems. The petals are broad and the colour is deep blood-red.

To Chrysanthemum 'Mrs. Wingfield Miller' (votes, 10 for, 4 against), from Messrs. Wells, Merstham. A pretty deep violet-rose single variety measuring 4 inches across. The centre is surrounded by a narrow band of white.

To *Prunus Miqueliana* (votes, unanimous), from Colonel Stephenson R. Clarke, C.B. (gr. Mr. Conn), Cuckfield. A pretty Japanese species, bearing numbers of many-petalled white flowers measuring 1 inch in diameter. The tree has proved to be hardy in mid-Sussex and flowers regularly in November and December. The open flowers can stand a few degrees of frost without suffering perceptible damage. (Fig. 204.)

Cultural Commendation.

To Mr. G. Cradduck, gr. to Colonel Lockwood, Romford, for Chrysanthemum 'Mrs. Swinburne.'

Other Exhibits.

Messrs. Barrie & Brown, London: Ericas and Begonias.
Miss Blacker, London: paintings.
Messrs. Cannell, Swanley: Chrysanthemums and Pelargoniums.
Messrs. Clibran, Altrincham: Begonia 'Duchess of Westminster.'
Mr. F. Cross, Nottingham: Carnations.
W. R. Dykes, Esq., M.A., Godalming: Iris pictures.
Mr. C. Elliott, Stevenage: alpines.
Mrs. English (gr. Mr. T. Crosswell), Hayes: Chrysanthemums.
Messrs. Fairbairn, Carlisle: Carnation 'Geisha.'
Miss Farrer, Acton: pictures.
Messrs. Felton, Hanover Square: Carnation 'Madame Charles Page.'
"The Garden," Covent Garden: paintings.
Mr. W. Gilden, Newchurch: Chrysanthemum.
Messrs. Godfrey, Exmouth: Chrysanthemums.
Miss di Guardi, Munster Park: paintings.
Mr. J. Howe, Cardiff: Chrysanthemums.
R. Hughes, Esq., Potters Bar: paintings.
Messrs. Jones, Lewisham: Chrysanthemums.
Mr. E. Lovett, Croydon: Sempervivums.
Miss B. Malone, Chelsea: pictures.
Messrs. Peed, West Norwood: Begonias.
Misses Price & Fyfe, Lee: Carnations and Chrysanthemums.
Mr. G. Reuthe, Keston: hardy plants.
Messrs. Stredwick, St. Leonards-on-Sea: Chrysanthemum 'Arthur Pickard.'
Messrs. Wallace, Colchester: *Iris Vartani* 'White Pearl.'
Messrs. Whitelegg & Page, Chislehurst: alpines.
Hon. Frances Wolseley, Glynde: models of gardens.
A. C. Wyatt, Esq., Thame: pictures.

FLORAL COMMITTEE, DECEMBER 17, 1912.

Mr. H. B. MAY, V.M.H., in the Chair, and sixteen members present.

Awards Recommended:—

Award of Merit.

To Carnation 'Benora' (votes, 8 for, 3 against), from Messrs. S. Low, Bush Hill Park, Enfield. A charming, fancy, perpetual-flowering variety, having a white ground flaked with scarlet. The petals are prettily serrated at the edges, and the flower is very full and of good shape. The calyx is non-bursting and the flower-stems very rigid. It appears to be very free in flowering and a good grower. It has a slight perfume. (Fig. 205.)

ORCHID COMMITTEE.

September 10, 1912.

Mr. J. Gurney Fowler in the Chair, and seventeen members present.

Awards Recommended:—

Silver Flora Medal.

To H. T. Pitt, Esq., Rosslyn, Stamford Hill (gr. Mr. Thurgood), for a group.

First-class Certificate.

To *Dendrobium Schützei* (votes, unanimous), from Messrs. Sander, St. Albans. A fine new species from the Philippine Isles allied to *D. Sanderae*, but in growth and flower much resembling *D. formosum*. Pseudobulbs stout, about 1 foot, bearing inflorescences of four or five flowers; pure white, with a small emerald-green disc to the lip, which has also a slight green base. (Fig. 206.)

To *Laeliocattleya* × 'Memoria H. A. Tracy' (*L.-c.* × *Canhamiana* × *C.* × *Hardyana*) (votes, unanimous), from H. S. Goodson, Esq., Fairlawn, Putney (gr. Mr. G. E. Day). A superb flower, with the features of *C.* × *Hardyana*, but larger in all its parts. Sepals white, tinged and veined with rosy-lilac. Petals broad, bright rose, with a silver veining at the edge. Lip purplish-crimson, with yellow disc. (Fig. 207.)

Award of Merit.

To *Odontioda* × *Devossiana*, Fowler's variety (*O. Edwardii* × *C. Noezliana*) (votes, unanimous), from J. Gurney Fowler, Esq., Glebelands, South Woodford (gr. Mr. J. Davis). Inflorescence branched, flowers 1 inch across, deep red, with yellow crest to the lip.

To *Laeliocattleya* × 'St. Gothard,' Glebe variety (*L.-c.* × *Gottoiana* × *C.* × *Hardyana*) (votes, unanimous), from C. J. Phillips, Esq., The Glebe, Sevenoaks. Flowers large and finely formed, rosy-lilac, with ruby-red lip, having a yellow disc and base.

Cultural Commendation.

To Messrs. Sander, St. Albans, for a fine specimen of *Vanda coerulea*, 4 feet in height, with 74 leaves and two fine spikes.

Other Exhibits.

E. H. Davidson, Esq.: a group.

H. S. Goodson, Esq.: rare Orchids.

His Grace the Duke of Marlborough: large plants.

Francis Wellesley, Esq.: *Laeliocattleya* × 'Mrs. Donald MacMaster' (*C. Dowiana aurea* × *L.-c.* × *luminosa*).

Mr. Sidney Flory: a group.

FIG. 207.—LAELIOCATTLEYA × 'MEMORIA H. A. TRACY.' (*Gard. Chron.*)
(p. cclxii.)

[*To face p.* cclxii.

Fig. 208.—Cymbidium × 'Doris' (*McBean.*) (*Half-size.*) (p. cclxv.)

Messrs. McBean: hybrids.
Messrs. Sander: a group.
Messrs. Stuart Low: a group.

Orchid Committee, September 24, 1912.

Mr. J. Gurney Fowler in the Chair, and twenty-one members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Lady Wernher, Luton Hoo (gr. Mr. Metcalfe), for *Vanda coerulea*, *Dendrobium formosum giganteum*, and Laeliocattleyas.

Silver Flora Medal.

To Messrs Hassall, Southgate, for hybrid Cattleyas, &c.
To Messrs. Stuart Low, for a group.

First-class Certificate.

To *Odontoglossum* × *Woodroffeae* (*Rossii rubescens* × 'Queen Alexandra') (votes, unanimous), from E. H. Davidson, Esq., Borlases, Twyford. Sepals reddish-claret, with thin wavy lines of yellow between the blotches. Petals similarly coloured but with smaller blotches. Lip rosy-lilac, with yellow crest. (Fig. 210.)

Award of Merit.

To *Odontoglossum* × 'Neptune' (*crispum* × *nebulosum*) (votes, unanimous), from Monsieur H. Graire, Amiens. Flowers intermediate between the two species; white with dark red spotting on the inner halves of the segments.

To *Odontioda* × 'Margarita' (*Odontoglossum madrense* × *Cochlioda Noezliana*), from Monsieur H. Graire. Flowers cinnabar-red, with the outer parts of the sepals and petals rose-pink.

To *Laeliocattleya* × 'Phoenix' (*L.-c.* × 'Henry Greenwood' × *C. Dowiana*), from C. J. Phillips, Esq. (votes, 17 for, 2 against). Flowers of medium size, rose, with claret-purple lip.

To *Zygopetalum maxillare Sanderianum* (votes, unanimous), from Sir Trevor Lawrence, Bart., K.C.V.O., Burford (gr. Mr. W. H. White). A large form, with pale green sepals and petals barred with light purple. Lip white with violet crest. Probably a large white-lipped form of the *Z. Sanderianum* of Regel's *Gartenflora* (1888).

To *Cattleya* × 'Lord Rothschild' var. *albescens* (*Gaskelliana alba* × *Dowiana aurea*) (votes, 11 for, 5 against), from Messrs. McBean. A pretty white variety, with much yellow in the lip, which has a pale lilac margin.

Cultural Commendation.

To Mr. J. E. Shill, gr. to Baron Bruno Schröder, for *Cypripedium* × 'W. R. Lee,' with over 40 flowers.

To Mr. Metcalfe, gr. to Lady Wernher, for *Vanda coerulea*.

Other Exhibits.

Baron Bruno Schröder: *Brassocattleya* × 'Mrs. Norman Cookson,' and a hybrid *Cypripedium*.

C. J. Phillips, Esq.: *Cattleya* × 'Fabia.'

Messrs. Charlesworth: rare Orchids.

Messrs. Sander: *Cattleya nobilis nobilior.*

Mr. Sidney Flory: various Orchids.

Messrs. Jas. Veitch: *Brassocattleya* × 'Ilene' *rosea.*

F. J. Hanbury, Esq.: hybrid Cypripediums.

Francis Wellesley, Esq.: *Laeliocattleya* × 'Mrs. Phayre' *magnifica.*

ORCHID COMMITTEE, OCTOBER 8, 1912.

MR. J. GURNEY FOWLER in the Chair, and twenty-two members present.

Awards Recommended:—

Silver-gilt Flora Medal.

To Messrs. Sander, St. Albans, for a group.

Silver Flora Medal.

To H. S. Goodson, Esq., Putney (gr. Mr. G. E. Day), for showy hybrids.

To E. H. Davidson, Esq., Twyford, for *Cattleya labiata.*

To H. T. Pitt, Esq. (gr. Mr. Thurgood), for hybrid Cattleyas.

To Messrs. Stuart Low, for a group.

Silver Banksian Medal.

To Messrs. J. Cypher, for a group.

First-class Certificate.

To *Cattleya* × 'Dionysius' (× *Fabia alba* × *Warscewiczii* 'Frau Melanie Beyrodt') (votes, 13 for, 5 against), from C. J. Phillips, Esq., The Glebe, Sevenoaks. A good flower with nearly white sepals and petals, and ruby-red lip with gold veining from the base.

Award of Merit.

To *Cattleya* × *Hardyana* 'Herbert Goodson' (*Warscewiczii* × *Dowiana aurea*) (votes, unanimous), from H. S. Goodson, Esq. (gr. Mr. G. E. Day). A good white form, with claret-red lip with gold veining.

To *Miltonioda* × *Harwoodii* (*Miltonia vexillaria* × *Cochlioda Noezliana*) (votes, unanimous), from Sir Trevor Lawrence, Bart., K.C.V.O. (gr. Mr. W. H. White). Flowers on erect scape, 1 inch across, rose-pink.

To *Odontioda* × *Charlesworthii*, Orchid Dene variety (*O. Harryanum* × *C. Noezliana*) (votes, 12 for, 4 against), from Messrs. McBean, Cooksbridge. Flowers of good size, deep blood-red, with yellow crest.

Other Exhibits.

Lieut.-Col. Sir Geo. L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander): three new hybrids.

Messrs. Charlesworth: hybrids.

R. G. Thwaites, Esq.: Odontoglossums and Odontiodas.

F. Du Cane Godman, Esq.: *Laeliocattleya* × *Godmanii.*

Pantia Ralli, Esq.: *Cattleya Dowiana aurea.*

Monsieur Chas. Maron: hybrids.

C. J. Phillips, Esq.: Odontoglossums.

Mr. Sidney Flory: *Pescatorea Dayana rhodacra.*

E. G. Mocatta, Esq.: *Odontoglossum* × 'Jasper.'

ORCHID COMMITTEE, OCTOBER 22, 1912.

MR. J. GURNEY FOWLER in the Chair, and twenty-three members present.

Awards Recommended :—

Silver Flora Medal.

To Baron Bruno Schröder, The Dell, Englefield Green (gr. Mr. J. E. Shill), for fine specimens of rare Orchids.

To Messrs. Sander, St. Albans, for a group, principally hybrids.

To Messrs. Stuart Low, Enfield, for a group of *Vanda coerulea*, Dendrobiums, &c.

To Messrs. J. Cypher, Cheltenham, for Cypripediums, &c.

Silver Banksian Medal.

To H. S. Goodson, Esq., Putney (gr. Mr. G. E. Day), for a group.

To Messrs. Hassall, Southgate, for a group of Cattleyas.

First-class Certificate.

To *Cattleya labiata* 'Opal' (votes, unanimous), from Baron Bruno Schröder (gr. Mr. J. E. Shill). Flowers of good shape, white, with a pale pink veining in front of the primrose-yellow disc of the lip.

To *Brassocattleya* × *Digbyano-Mossiae*, The Dell variety (*B. Digbyana* × *C. Mossiae Wageneri*) (votes, unanimous), from Baron Bruno Schröder. The largest of the white Brassocattleyas, and with a very fine, fringed lip.

To *Cymbidium* × 'Doris' (*Tracyanum* × *insigne*) (votes, 12 for, 5 against), from Messrs. McBean, Cooksbridge. The inflorescence is erect and the flowers shaped like those of *C. insigne*, but coloured like *C. Tracyanum.* Sepals and petals pale yellow, tinged and lined chocolate-purple; lip primrose-yellow, with red spots. (Fig. 208.)

To *Cypripedium* × 'Pallas Athene' (parentage unrecorded) (votes, unanimous), from W. R. Lee, Esq., Plumpton Hall, Heywood (gr. Mr. Branch). Flower of fine shape, resembling *C.* × *Fulshawense*, but larger and with a broader dorsal sepal. (Fig. 209.)

Award of Merit.

To *Cattleya* × 'Maggie Raphael,' Goodson's variety (*Dowiana aurea* × *Trianae*) (votes, unanimous), from H. S. Goodson, Esq. (gr. Mr. G. E. Day). Flowers large, bright rose colour, with ruby-crimson lip, veined with orange colour.

To *Sophrolaeliocattleya* × 'Menippe' var. 'H. S. Goodson' (*S.-l.* × *heatonensis* × *C.* × *Hardyana*) (votes, unanimous), from H. S. Goodson, Esq. Flowers reddish-mauve, with claret lip.

To *Laeliocattleya* × 'Comte de Hemptinne' (*L.-c.* × *ronselensis* × *C. Dowiana aurea*) (votes, unanimous), from Comte Joseph de Hemptinne, St. Denis, Ghent. Sepals and petals chrome-yellow; lip tinged with red.

To *Laeliocattleya* × 'Golden Oriole,' Holford's variety (*L.-c.* × *Charlesworthii* × *C. Dowiana aurea*) (votes, 12 for, 0 against), from Lieut.-Col. Sir George L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander). Resembling *C. Dowiana aurea*, but with orange-coloured sepals and petals, and ruby-crimson lip veined with gold.

To *Cattleya* × 'Comet' var. 'Princess Mary' (*Warneri alba* × *Dowiana*) (votes, unanimous), from Pantia Ralli, Esq., Ashtead Park, Surrey. Flowers white with yellow disc to the lip, which has slight purple markings.

To *Sophrolaeliocattleya* × 'Sandhage' (*S.-l.* × *heatonensis* × *C.* × 'Enid') (votes, 12 for, 2 against), from E. H. Davidson, Esq., Orchid Dene, Twyford. In form and size nearly equal to *C.* × 'Enid' (*Mossiae* × *Warscewiczii*), and with little evidence of the *Sophrolaelia* appearing. Colour deep rose, with a ruby-red lip.

Other Exhibits.

Lieut.-Col. Sir George L. Holford, K.C.V.O.: *Cattleya* × 'Mercutio' (*Harrisoniana* × 'Lord Rothschild').

C. J. Phillips, Esq., Sevenoaks (gr. Mr. Bucknell): three new Cattleya hybrids.

R. le Doux, Esq.: *Cattleya* × 'Adula' var. 'Ena.'

Messrs. Charlesworth: a group.

Messrs. McBean: a group.

Mr. E. V. Low: Cattleyas.

Walter Cobb, Esq.: three hybrids.

Messrs. Mansell & Hatcher: several species.

ORCHID COMMITTEE, NOVEMBER 5, 1912.

MR. J. GURNEY FOWLER in the Chair, and twenty-seven members present.

Awards Recommended:—

First-class Certificate.

To *Vanda coerulea* 'Lady Holford' (votes, unanimous), from Lieut.-Col. Sir George L. Holford, K.C.V.O., Westonbirt (gr. Mr.

FIG. 209.—CYPRIPEDIUM × 'PALLAS ATHENE.' (*Gard. Mag.*) (p. cclxv.)

[*To face p.* cclxvi

Fig. 211.—Laeliocattleya × 'Orion' var. 'Othello.'
(*Gard. Mag.*) (p. cclxvii.)


N.R.
N.R.

Fig. 214.—Cypripedium × elatior, Shrubbery var. (*Garden.*) (p. cclxix.)

H. G. Alexander). A very beautiful variety, with silver-white flowers tinged with sky-blue and veined with violet colour. The plant bore two spikes with 35 flowers.

To *Cattleya* × *Peetersii*, Westonbirt variety (*labiata alba* × *Hardyana alba*) (votes, unanimous), from Lieut.-Col. Sir George L. Holford. Flowers large, white, freckled with rose, the lip being ruby-red veined with yellow.

To *Laeliocattleya* × 'Orion' var. 'Othello' (*L.-c.* × *Haroldiana* × *C. Dowiana aurea*) (votes, unanimous), from Messrs. Charlesworth. Flower of good shape and uniformly dark colour. Sepals and petals rose-purple with light veining. Lip claret, with thin yellow reticulation. (Fig. 211.)

To *Cattleya* × 'Rhoda' var. 'The Jewel' (*Iris* × *Hardyana*) (votes, unanimous), from Messrs. Charlesworth. Sepals and petals canary-yellow. Lip cherry-red, with yellowish margin and yellow veins from the base.

To *Odontioda* × *Bradshawiae gattonensis* (*O. crispum* var. 'Lady Colman' × *C. Noezliana*) (votes, 15 for, 3 against), from Sir Jeremiah Colman, Bart., Gatton Park (gr. Mr. Collier). Flowers uniformly deep scarlet. (Fig. 212.)

To *Odontoglossum* × 'Aurora' (*Rossii rubescens* × *Lambeauianum*) (votes, unanimous), from Messrs. Jas. Veitch. A very remarkable hybrid. Sepals and petals broad, the inner part having densely-blotched bronzy-red bands, the margins shaded with rose. Lip large, rose-purple, with yellow and white crest. (Fig. 213.)

Award of Merit.

To *Cattleya* × 'Fabia' *gloriosa* (*labiata* × *Dowiana aurea*) (votes, unanimous), from Lieut.-Col. Sir George L. Holford. The showiest variety yet exhibited. Flowers large, bright rose, with a broad crimson lip having a yellow disc and veining.

To *Cattleya* × *Hardyana* 'La Perle' (*Warscewiczii alba* × *Hardyana alba*) (votes, unanimous), from Sir George Holford. A large blush-white flower, with purple markings in front of the yellow disc of the lip.

To *Cypripedium* × 'Muriel' (× 'Hera Euryades' × 'Cynthia') (votes, unanimous), from Lieut.-Col. Sir George L. Holford. Of the *C.* × 'Hera' section, but with a very broad white dorsal sepal, finely spotted with dark purple.

To *Cypripedium* × 'Glebelands' (*Lathamianum* × *insigne Chantinii*) (votes, unanimous), from J. Gurney Fowler, Esq., Glebelands, South Woodford (gr. Mr. J. Davis). Petals and lip broad, yellowish-green tinged with purple. Dorsal sepal large, white, with a small green base from which ascend dotted lines of purple and rose.

To *Cattleya* × 'Venus' var. 'Princess' (× 'Iris' × *Dowiana aurea*) (votes, unanimous), from Messrs. Charlesworth. Flowers yellow, with ruby-red lip.

To *Brassocattleya* × 'Madame Hye,' Ashton's var. (*B. Digbyana*

× *C. Harrisoniana*) (votes, unanimous), from E. R. Ashton, Esq., Broadlands, Tunbridge Wells. Sepals and petals rose-pink. Lip broadly expanded, slightly fringed, white, with a yellow shade.

To *Cattleya* × 'Oberon' ('Fabia' × *Hardyana*) (votes, unanimous), from E. R. Ashton, Esq. A good flower, resembling a light-coloured *C. Hardyana*.

To *Laeliocattleya* × 'Walter Gott' (*C. bicolor* × *L.-c.* × *bletchleyensis*) (votes, unanimous), from Messrs. Sander. Flowers equal to a good *C.* × 'Iris,' purplish-rose, with dark mauve lip.

To *Odontoglossum* × *eximium*, McBean's variety (*ardentissimum* × *crispum*) (votes, unanimous), from Messrs. McBean, Cooksbridge. Flowers resembling *O. crispum* 'Leonard Perfect,' the hybridity showing only slightly in the lip.

Other Exhibits.

Lieut.-Col. Sir George L. Holford, K.C.V.O.: new hybrids.

Sir Trevor Lawrence, Bart., K.C.V.O.: *Cattleya* × 'Venus,' Burford variety.

Mrs. Norman Cookson (gr. Mr. H. J. Chapman): fine hybrid Calanthes.

W. P. Burkinshaw, Esq.: two Cypripediums.

de B. Crawshay, Esq.: *Odontioda* × 'Bella.'

C. J. Phillips, Esq.: two fine Cattleyas.

Orchid Committee, November 19, 1912.

Sir Harry J. Veitch in the Chair, and twenty-one members present.

Awards Recommended :—

Gold Medal.

To his Grace the Duke of Marlborough, Blenheim Palace (gr. Mr. Hunter), for a very fine group of *Vanda coerulea* set up with *Cypripedium insigne Sanderae* and other Cypripediums.

Silver Lindley Medal.

To Mr. Hunter, gr. to his Grace the Duke of Marlborough, for excellent cultivation of *Vanda coerulea*.

Silver Flora Medal.

To Messrs. Stuart Low, Enfield, for Cattleyas, Oncidiums, &c.

Silver Banksian Medal.

To Messrs. Jas. Veitch, for hybrids.
To Messrs. Sander, for a group.
To Messrs. Cypher, for a group.

Bronze Banksian Medal.

To Messrs. Swan & Price, St. Albans, for Cypripediums.

First-class Certificate.

To *Laeliocattleya* × 'Bella,' Orchid Dene variety (*L. purpurata* × *C. labiata*) (votes, 15 for, 3 against), from E. H. Davidson, Esq. Flower nearer to *C. labiata* than in other forms; rosy-lilac, with purplish-crimson lip having a white base.

To *Cypripedium* × *elatior*, Shrubbery variety (*Leeanum* × 'Baron Schröder') (votes, 17 for, 2 against), from F. Menteith Ogilvie, Esq., The Shrubbery, Oxford (gr. Mr. Balmforth). The best and darkest form. Dorsal sepal white, heavily blotched with purplish-chocolate colour. (Fig. 214.)

Award of Merit.

To *Cypripedium* × 'Latona' ('Niobe' × 'Alcibiades') (votes, 16 for, 0 against), from Lieut.-Col. Sir George L. Holford, K.C.V.O., Westonbirt (gr. Mr. H. G. Alexander). Flower of good shape. Petals and lip greenish-yellow, tinged and marked with mahogany-red. Dorsal sepal white, spotted in the lower half with dark rose.

To *Laeliocattleya* × 'Scylla' (*L.-c.* × *Cappei* × *C.* × 'Lord Rothschild') (votes, unanimous), from F. M. Ogilvie, Esq. Flowers produced eight to ten on a spike; apricot-yellow, with a rose ray inside the margin of the lip.

Other Exhibits.

Sir Trevor Lawrence, Bart., K.C.V.O. (gr. Mr. W. H. White): *Laeliocattleya* × 'Adolph-Iris.'

Lieut.-Col. Sir George L. Holford: *Laeliocattleya* × 'Neleus.'

E. H. Davidson, Esq.: two hybrid Odontoglossums.

Messrs. Charlesworth: a group.

Messrs. McBean: hybrid *Laeliocattleya.*

C. J. Lucas, Esq.: two hybrids.

W. Thom, Esq.: hybrid Cypripedium.

Lady Theodore Guest: *Cattleya* × 'Neptune.'

H. S. Goodson, Esq.: hybrids.

Messrs. Hassall: a group.

ORCHID COMMITTEE, DECEMBER 3, 1912.

Mr. J. GURNEY FOWLER in the Chair, and twenty-two members present.

Awards Recommended :—

Silver Flora Medal.

To Messrs. Jas. Veitch, for hybrids.

To Messrs. Sander, for hybrids and rare species.

Silver Banksian Medal.

To H. T. Pitt, Esq. (gr. Mr. Thurgood), for a group.

To Messrs. J. Cypher, for Cypripediums.

To Messrs. W. Baylor Hartland, Cork, for Cypripediums, &c.

First-class Certificate.

To *Laeliocattleya* × 'Golden Oriole' var. 'Ruby' (*L.-c.* × *Charlesworthii* × *C. Dowiana aurea*) (votes, unanimous), from Lieut.-Colonel Sir George L. Holford, K.C.V.O. (gr. Mr. H. G. Alexander). A very fine variety, differing from the yellow type in that the whole flower is deep claret-red, with delicate yellow veining on the petals and lip.

To *Odontioda* × 'Latona,' Fowler's variety (*Odontioda* × *Bradshawiae* × *Odontoglossum* × *crispo-Harryanum*) (votes, unanimous), from J. Gurney Fowler, Esq. (gr. Mr. J. Davis). Flower large; ground colour white, with a rose margin to the segments, and dark red blotching on the inner surface of the sepals and petals. (Fig. 215.)

Award of Merit.

To *Cypripedium* × 'Viking' (*Buchanianum* × *illustre*). The firm substance and general appearance of *C. Buchanianum* (*Druryi* × *Spicerianum*) prevails; *C.* × *illustre* (*Lathamianum* × *nitens*) giving increased size. Dorsal sepal white, with an ovate violet-purple band; petals and lip yellow, tinged with red-brown.

To *Sophrolaelio-cattleya* × 'Carna' (*L.-c.* × *Cappei* × *S.-l.* × *heatonensis*). Flowers nearly three inches across, magenta-rose, with yellow disc to the lip.

To *Cypripedium* × 'Eurybiades' ('Hera Euryades' × 'Alcibiades') (votes, 12 for, 0 against), from Sir Trevor Lawrence, Bart., K.C.V.O. (gr. Mr. W. H. White). An improvement on *C.* × 'Hera Euryades.' Dorsal sepal white, with a green base, and maroon-purple blotches; petals and lip greenish yellow, tinged with mahogany-red.

Cultural Commendation.

To Mr. W. H. White, orchid grower to Sir Trevor Lawrence, Bart., for a large specimen of the dwarf *Sigmatostalix radicans*, with about sixty sprays of flowers.

Other Exhibits.

Lieut.-Colonel Sir Geo. L. Holford, K.C.V.O.: hybrids.

Messrs. McBean: a group.

Messrs. Charlesworth: a group.

His Grace the Duke of Marlborough: *Cypripedium* × 'Beatrice.'

J. Gurney Fowler, Esq.: *Odontoglossum* and *Cypripedium Leeanum* 'J. Gurney Fowler.'

Messrs. Swan & Price: *Cypripedium* ×.

Messrs. Hassall: a group.

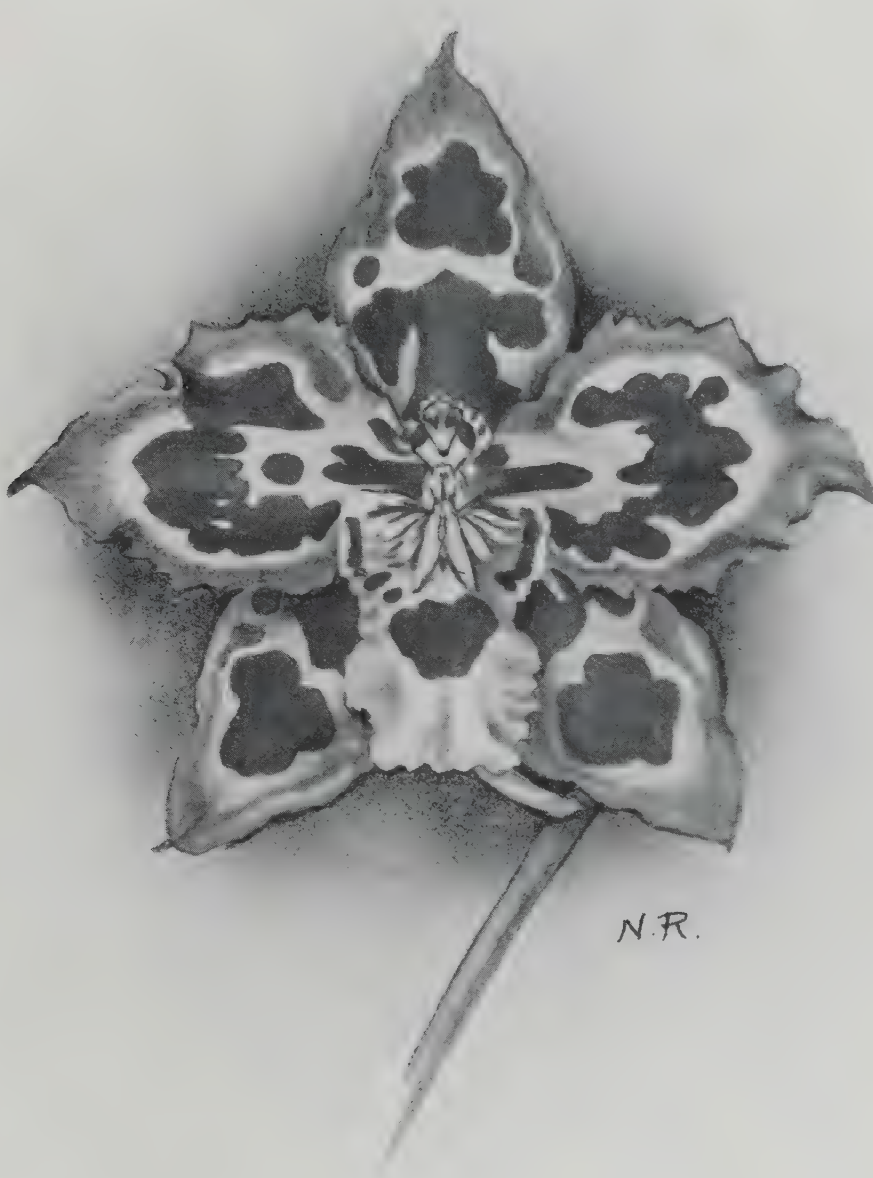


FIG. 215.—ODONTIODA × 'LATONA,' FOWLER'S VAR. (p. cclxx)

FIG. 216.—CYPRIPEDIUM × 'DEMETER.' (*Gard. Mag.*) (p. cclxxi.)

ORCHID COMMITTEE, DECEMBER 17, 1912.

Mr. J. GURNEY FOWLER in the Chair, and fifteen members present.

Awards Recommended:—

Silver Lindley Medal.

To Mr. Arthur Dye (gr. to the Right Hon. Lord Rothschild), for a fine example of the original *Phalaenopsis intermedia Portei*, which has been growing at Tring more than thirty years.

First-class Certificate.

To *Cypripedium* × 'Demeter' (*C.* × 'G. F. Moore' × *C.* × 'Earl of Tankerville') (votes, 11 for, 1 against), from Lieut.-Colonel Sir Geo. L. Holford, K.C.V.O. A fine flower. The dorsal sepal is white, the lower half emerald-green, blotched with reddish-purple; petals and lip yellow, tinged with purple. (Fig. 216.)

To *Sophrolaeliocattleya* × 'Miss Edith d'Abrew' var. 'Thisbe' (*C.* × 'Iris' × *S.-l.* × *heatonensis*) (votes, unanimous), from F. M. Ogilvie, Esq., The Shrubbery, Oxford (gr. Mr. Balmforth). Flower deep blood-red, the lip having a crimson tint.

Award of Merit.

To *Cypripedium* × 'Sir William Chance' (*Thompsonii* × *Memoria Jerninghamiae*) (votes, unanimous), from Francis Wellesley, Esq., Westfield, Woking (gr. Mr. Hopkins). Flower of firm texture, and glossy surface; dorsal sepal white, with a central violet band; petals and lip honey-yellow, the petals with a medium claret-coloured line.

To *Sophrocattleya* × *westfieldensis* (*C. labiata* × *S.-c.* × *eximia* (votes, unanimous), from Francis Wellesley, Esq. Flowers bright-rose colour, with mauve-crimson lip.

To *Odontoglossum* × 'Jasper,' Fowler's variety (*crispum* 'Victoria Regina' × *amabile*) (votes, unanimous), from J. Gurney Fowler, Esq. (gr. Mr. J. Davis). Flowers large, rose-colour, with claret-red markings.

To *Odontoglossum* × *scintillans*, Orchid Dene variety (*Rossii rubescens* × *Wilckeanum*) (votes, 9 for, 4 against), from E. H. Davidson, Esq. Sepals blotched claret-red; petals white, with lilac margin and red spotting; lip rosy-lilac, with a white disc and red blotch.

To *Odontoglossum* × *eximium* 'J. Lakin' (*ardentissimum* × *crispum*, blotched variety) (votes, unanimous), from E. H. Davidson, Esq. Flowers white, tinged with purple at the back, and closely spotted with reddish-violet colour.

To *Cattleya* × 'Tityus' ('Enid' × 'Octave Doin') (votes, unanimous), from H. S. Goodson, Esq. (gr. Mr. G. E. Day). A finely shaped rose-coloured flower, with yellow disc to the lip.

To *Cypripedium* × 'Idina' (*Dicksonianum* × *insigne* 'Harefield

Hall' (votes, unanimous), from Messrs. Jas. Veitch. Resembling *C. insigne* 'Harefield Hall,' but with broader dorsal sepal.

To *Oncidioda* × *cinnabarina* (*C. Noezlianum* × *O. Monachicum*) (votes, unanimous), from Messrs. Charlesworth. Inflorescence elongated, branched; flowers red.

Cultural Commendation.

To Mr. W. H. White, orchid grower to Sir Trevor Lawrence, Bart., for *Platyclinis uncata* with 68 spikes.

Other Exhibits.

Sir Trevor Lawrence, Bart., K.C.V.O.: *Eria Fletcheri*, and *Cymbidium gattonense.*

E. H. Davidson, Esq.: *Cattleya* × 'Maggie Raphael,' Orchid Dene variety.

Clement Moore, Esq., New Jersey, U.S.A.: *Cattleya* × 'A. Dimmock.'

Lieut.-Colonel Sir Geo. L. Holford, K.C.V.O.: *Cypripedium* × 'Artemis' (*nitens* × *Fairrieanum*).

Messrs. Jas. Veitch: hybrid Cypripediums.

Messrs. Stuart Low: very dissimilar hybrids between *Laelia* × 'Iona' and *Cattleya Dowiana aurea.*

Mr. Harry Dixon: *Oncidium Jamesoni.*

O. O. Wrigley, Esq.: *Cypripedium* × 'Mrs. Harry Bruce' (*Sallieri* × *Thompsonii*).

Messrs. Charlesworth: various Orchids.

H. S. Goodson, Esq.: Odontoglossum.

RECOGNITION OF CHILDREN'S WORK IN PLANT LIFE.

In 1910 the Council founded a card of "Recognition of Diligent Interest in Plants," to be bestowed upon children as an encouragement to work carefully and interestedly in plant life.

The "Recognition" has been sent to the following during 1912:—

Mar. 14.	To Leslie Kingsbury,	First in the Garden Plot Competition, Halstead Council School.
Mar. 23.	To Hugh Parsons,	First in Ripley School Bulb Competition for children under ten.
,, ,,	To Amy Clack,	First in Thorney Hill School Bulb Competition for children over ten.
Mar. 30.	To William Brambleby,	First in the Garden Plot Competition, Northwood Council School.
,, ,,	To Edith Spencer,	First Senior Girl in the Nature Study Competition, Northwood Council School.
,, ,,	To Harry Coles,	First Senior Boy in the Nature Study Competition, Northwood Council School.
,, ,,	To Marjorie Watts,	First Junior Girl in the Nature Study Competition, Northwood Council School.
,, ,,	To Charles Chapman,	First Junior Boy in the Nature Study Competition, Northwood Council School.
,, ,,	To Edwin Smith,	First in the Competition for Pen and Pencil Drawings of Flowers from Nature, Northwood Council School.
,, ,,	To Kathleen Mitton,	First in the Water-Colour Drawings of Flowers from Nature, Northwood Council School.
Sept. 11.	To John Isaac Cockhill,	First in the Nature Study Competition held by the Lancs and Cheshire Union of Institutes, Brierfield.
Oct. 31.	To Harry Martin,	First for the Best Kept School Garden, Westerham National School.
Nov. 6.	To Robert Woodgate,	First Boy in Chrysanthemum Competition, Eastbourne Horticultural Society.
,, ,,	To Kate Holding,	First Girl in Chrysanthemum Competition, Eastbourne Horticultural Society.

ESTABLISHED 1804.

INCORPORATED 1809.

TELEGRAMS: "HORTENSIA, SOWEST LONDON."

TELEPHONE: 5363 VICTORIA.

ROYAL HORTICULTURAL SOCIETY,

VINCENT SQUARE, WESTMINSTER, S.W.

NOTICES TO FELLOWS.

1. GENERAL.

Notices to Fellows are always added at the end of each number of the JOURNAL, immediately preceding the Advertisements, and also at the beginning both of the "Book of Arrangements" and of the "Report of the Council." Fellows are particularly requested to consult these Notices, as it would often save them and the Secretary much needless correspondence.

2. LETTERS.

All letters on *all* subjects should be addressed—The Secretary, Royal Horticultural Hall, Vincent Square, Westminster, S.W.

3. TELEPHONE AND TELEGRAMS.

Telephone Number: **5363 VICTORIA.**

"**HORTENSIA, SOWEST, LONDON,**" is sufficient address for telegrams.

4. JOURNALS WANTED.

The Secretary would be greatly obliged by the return to the Society of ANY NUMBERS of the JOURNAL which may be of no further use to Fellows. Complete sets are occasionally applied for, but, at the present moment, not even one can be supplied owing to the stock of the following being exhausted :—

VOLUME IV. Part 14.	VOLUME XIII. Part 1.
VOLUME V. Part 1.	VOLUME XIV.
VOLUME X.	VOLUME XV. Parts 2 and 3.

These are, therefore, particularly asked for.

5. SUBSCRIPTIONS.

All annual subscriptions are payable in advance on the 1st day of January in each year. A Fellow, if elected before the 1st of July, shall pay the annual subscription for the current year; if elected after the 1st of July and before the 1st of October, he shall pay half a year's subscription; if elected after the 1st of October and before the 1st of January, he shall pay at the time of his election the full amount of his subscription for the year commencing from the 1st day of January then next, and no further subscription until the next succeeding 1st of January. To avoid the inconvenience of remembering their subscriptions Fellows can *compound* by the payment of one lump sum in lieu of all further annual payments; or they can, by applying to the Society, obtain a form of instruction to their bankers to pay for them every January 1. It may be a week or more before the Tickets reach the Fellows, owing to the very large number (over 20,000) to be despatched within the first month of the year. Fellows who have not already given an order on their bankers for the payment of their subscriptions each year are requested to do so, as this method of payment is preferred, and saves the Fellows considerable trouble. Fellows whose subscriptions remain unpaid are debarred from all the privileges of the Society; but their subscriptions are nevertheless recoverable at law, the Society being incorporated by Royal Charter.

In paying their subscriptions, Fellows often make the mistake of drawing their cheques for Pounds instead of for Guineas. Kindly note that in all cases it is Guineas, and not Pounds. Cheques and Postal Orders should be made payable to "The Royal Horticultural Society" and crossed "London County and Westminster Bank, Victoria Branch, S.W."

6. FORM OF BEQUEST.

I give and bequeath to the Treasurer for the time being of the Roya Horticultural Society, London, the sum of £ , to be paid out of such part of my personal estate as I can lawfully charge with the payment of such legacy, and to be paid free of legacy duty, within six months of my decease; the receipt of such Treasurer to be a sufficient discharge for the same. And I declare that the said legacy shall be applied towards [the general purposes of the Society].*

7. PRIVILEGES OF CHEMICAL ANALYSIS.

Instructions are contained at page 107 in the "Book of Arrangements," 1913.

8. LIST OF FELLOWS.

A list of all the Fellows of the Society is sent out in January. Fellows are requested to look at their own names in it, and if in any way these are incorrect, or the address insufficient, they are requested to inform the Secretary at once. Forms of Nomination, and of the Privileges of Fellows, are bound in with every number of the JOURNAL (Advt. pp. 32, 33) and the "Book of Arrangements."

9. NEW FELLOWS.

The President and Council fully appreciate how much the prosperity of the Society and its present large number of Fellows are due to the efforts of Fellows to enlist the sympathy of their friends; and the steady advance during recent years indicates the increasing recognition of the Society's work and usefulness. But it must not be supposed that a maximum has yet been reached. There is ample room for a great increase of Fellows, especially in America and the Colonies.

10. AN APPEAL.

What has been accomplished for the Society since 1887 is largely due to the unwearied assistance afforded by a small proportion of the Fellows; but as all belong to the same Society, so it behoves each one to do what he or she can to further its interests, especially by:—

1. Increasing the Number of Fellows.
2. Helping to swell the Fund for providing Prizes for the Students at Wisley.
3. Providing Lectures with Lantern Slides.
4. Presenting Books to fill the gaps in the Library both at Vincent Square and at Wisley.
5. Sending new or rare Plants and Seeds for the Garden and surplus Roots for distribution to the Fellows.
6. Sending Plants for the *New Rock Garden* at Wisley.

Thus there is plenty for all to do according to their individual liking:

* Any special directions or conditions which the testator may wish to be attached to the bequest may be substituted for the words in brackets.

personal effort, money, plants, books, are all alike needed. The Secretary asks those who read these lines to help in the ways above indicated.

11. R.H.S. GARDENERS' DIARY.

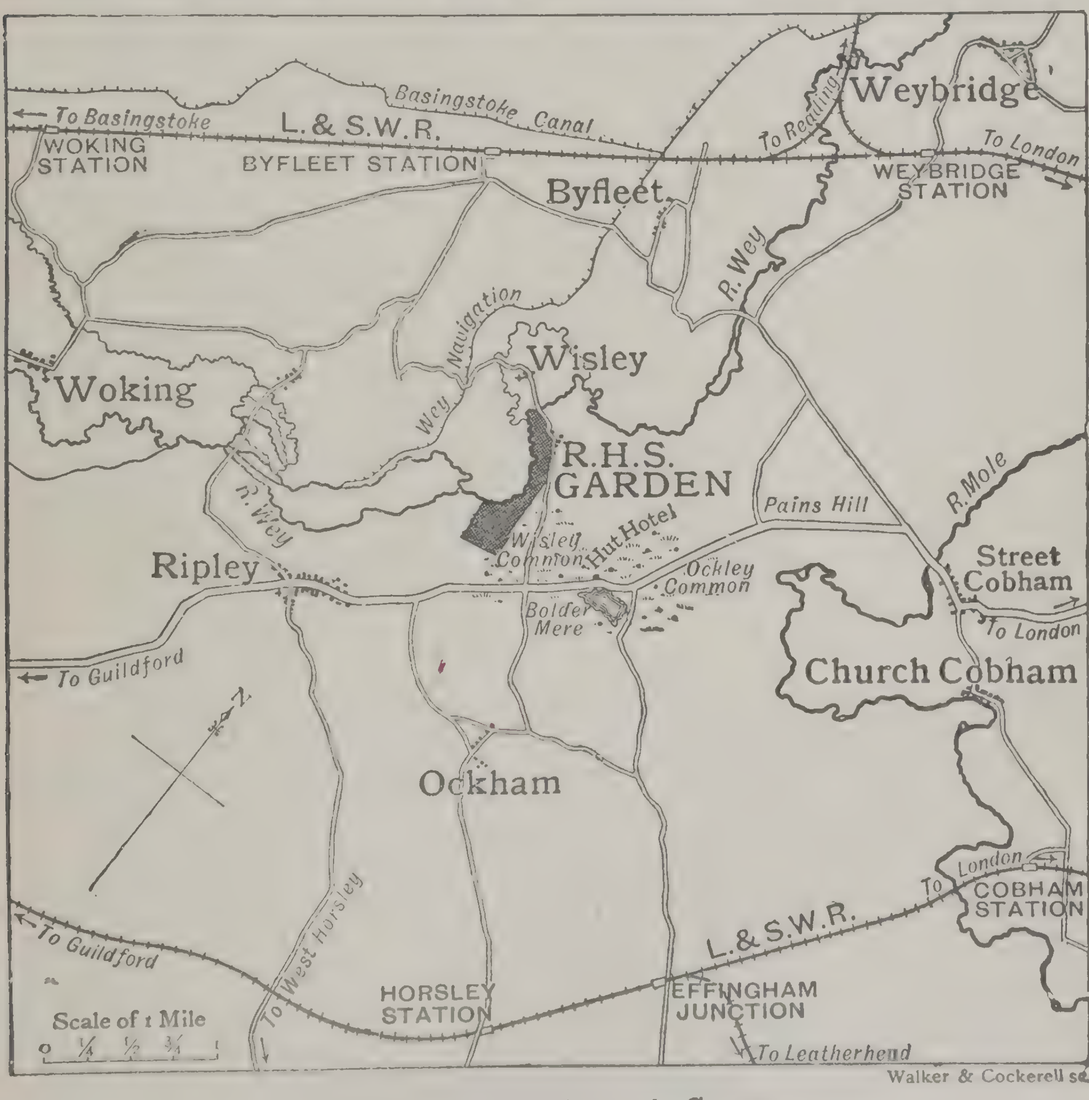
The R.H.S. Gardeners' Diary for 1913 is now issued. It contains a considerable quantity of new information, and it has been compiled more especially for the single-handed gardener. The price is 1*s.* 1*d.*, post free, from the R.H.S. Office, Vincent Square, London, S.W.; or 2*s.* 1*d.* if leather-bound.

12. LINDLEY LIBRARY.

The Society, acting in and through its Council, having now become sole trustee of the Lindley Library, Fellows and friends of the R.H.S. have the encouragement of knowing that their gifts to the Library can never be lost to the Society, but are attached to it in perpetuity. It should now be the aim of all to make the Library far more perfect and complete than it is at present. Gifts of books, old or new, will be gratefully accepted.

13. THE SOCIETY'S GARDENS AT WISLEY.

The Gardens are open daily to Fellows and others showing Fellows' Transferable Tickets, from 9 A.M. till sunset, except on Sundays, Good



POSITION OF THE SOCIETY'S GARDENS.

Friday, Christmas Day, and Exhibition Days. Each Fellow's Ticket admits three to the Gardens. The Public are not admitted.

The Gardens, situated at Wisley (about 2 miles from Ripley, in Surrey), are about 3 miles from Byfleet, $3\frac{1}{2}$ miles from Horsley, and $5\frac{1}{2}$ miles from Weybridge, all stations on the South-Western Railway, with frequent trains from Waterloo and Clapham Junction. Carriages to convey four persons can be obtained by writing to Mr. D. White, fly proprietor, Ripley, Surrey; the charge being, to and from Weybridge, waiting two hours at the Gardens, 8*s.*; or waiting three hours, 10*s.*; or to and from Horsley, 7*s.*; Effingham Junction, 7*s.*; Byfleet, 7*s.* Visitors should in all cases be careful to state the trains they intend to arrive by and leave by. Carriages can also be obtained at Weybridge for 8*s.* by writing to Mr. Trembling, New Road, Weybridge. Excellent accommodation and refreshments can be had at the Hut Hotel, close to the Gardens, and also at the Hautboy at Ockham.

The motor route from London to Wisley will be found in the "Book of Arrangements," p. 146.

14. ROCK GARDEN AT WISLEY.

In consequence of the rapidly increasing interest taken in what are popularly called "Alpine Plants," "Alpines," or "Rock Plants," the Council have constructed a Rock Garden at Wisley on a somewhat extensive scale. The idea is to obtain the best possible positions and soils for the different plants to grow in, the growth and well-being of the plants being considered to be of even greater importance than the artistic effect of the rockwork. In a Horticultural Society's Garden every single detail should teach something, so that Fellows visiting it may be able to take away an idea of how best to do this or that, or where best to plant this or that. The construction of the Rock Garden is completed, and the planting is proceeding, but it will be two, or possibly three, years or more before the plants on it can be seen at their best.

An Alpine Plant House has been erected above the Rock Garden, chiefly for the purpose of growing those rock plants to perfection which blossom too early to withstand our wet winters and late spring frosts. In this House Fellows will be able to see such plants in flower from February onwards.

15. TRIALS AT WISLEY IN 1913–14.

The Special Regulations for the direction of Trial Sub-Committees will be found on p. 33, "Book of Arrangements."

N.B.—Everything sent for trial *must be named*, and the name and address of the sender attached.

Fruit.

Strawberries, Autumn Fruiting.—20 runners of each.

Berry-bearing Fruits.—Three plants of each by February. Strawberries, Raspberries, Gooseberries, and Currants excluded.

Flowers.

Antirrhinums.—Seed to be sent in February.

Aquilegias.—Seed to be sent in February.

Pyrethrums.—Seeds and plants to be sent in February.

Gaillardias.—Seeds and plants to be sent in February.

Violas.—Three plants of each to be sent at once. See notice below.

Bearded Flag or German Irises.—Two plants of each to be sent in July, 1913.

Vegetables.

Peas.—One pint of seed to be sent in February.

Potatos.—Early and mid-season. Each variety must be labelled as being "early" or "mid-season." Twenty tubers of each by February.

Tomatos.—Inside and out; one packet of seed to be sent in February.

Turnips.—One packet of seed to be sent in February.

The Wisley Viola Trial.

The trial of Violas has this year been so successful, particularly in the late spring and early summer, that it has been suggested (and the Council have accepted the suggestion) that the trial should be continued in 1913 with a special view to the date of the flowering of the various varieties. Growers, amateur as well as trade, are therefore requested to send three rooted cuttings of each variety (old as well as new), so that they may be planted before the third week in October.

Trial of Cape Pelargoniums.

The Council of the Royal Horticultural Society have been asked to endeavour to obtain an agreement on the Nomenclature of what are commonly known as Cape Pelargoniums. The only practical way known to the Council is to invite all growers of these plants to *at once* send cuttings (rooted or otherwise), with the name known to the sender attached, by post to the Superintendent, R.H.S. Gardens, Wisley, Ripley, Surrey. They will be potted up and next year be compared with each other, and with herbarium specimens and printed records. No Zonals or Show or French Pelargoniums should be sent; only those known as 'Cape.'

If sent by post: The Superintendent, R.H.S. Gardens, Wisley, Ripley, Surrey.

If sent by rail: The Superintendent, R.H.S. Gardens, Wisley, Horsley Station, L. &. S.-W. R., with advice by post to the Superintendent.

16. TRIAL OF SUNDRIES.

During the past year a scheme for the trial of Horticultural Sundries has been initiated. The trials will be conducted at Wisley, and the articles sent adjudicated upon by a Special Committee, who will recommend suitable awards to the Council. These awards will be bestowed at the Chelsea or Holland House Shows following the conclusion of the trials. The award cards, &c., can then be displayed by the exhibitors with the

articles referred to. These special awards will remain good for ten years, after which time the exhibitor will contract with the Council to cease advertising the award, unless it shall have been subsequently granted for another period of ten years. The ten years' period has been established in view of the possibility of still better goods or inventions, &c., than those which first won an award coming under the Society's notice. (See "Book of Arrangements," 1913, p. 149.)

17. THE WISLEY RESEARCH STATION.

Investigations are now in full swing at the new Research Station and Laboratory at Wisley. All communications relating to them should be addressed to Mr. F. J. Chittenden, F.L.S., Director of the Research Work on Scientific Matters affecting Practical Horticulture and Lecturer to the Students.

18. STUDENTS AT WISLEY.

N.B.—There will be a few vacancies for the two years' Course commencing in September, 1913. Early application should be made to the Secretary.

The Society admits young men, between the ages of sixteen and twenty-two years, to study Gardening at Wisley. The curriculum includes not only practical garden work in all the main branches of Horticulture, but also Lectures, Demonstrations, and Horticultural Science in the Laboratory, whereby a practical knowledge of Garden Chemistry, Biology, &c., may be obtained. The Laboratory is equipped with the best apparatus procurable for Students. The training extends over a period of two years, with a progressive course for each year. Students can enter only at the end of September or the end of March. Selected Students have also the advantage of attending certain of the Society's Shows and Lectures in London.

19. DISTRIBUTION OF SURPLUS PLANTS.

In a past Report the Council drew attention to the way in which the annual distribution of surplus plants has arisen. In a large garden there must always be a great deal of surplus stock, which must either be given away or go to the waste-heap. A few Fellows, noticing this, asked for plants which would otherwise be discarded; and they valued what was so obtained. Others hearing of it asked for a share, until the Council felt they must either systematize this haphazard distribution or else put a stop to it altogether. To take the latter step seemed undesirable. Why should not such Fellows have them as cared to receive such surplus plants? It was, therefore, decided to keep all plants till the early spring, and then give all Fellows alike the option of claiming a share of them by Ballot.

Fellows are, therefore, particularly requested to notice that only waste and surplus plants raised from seeds or cuttings are available for distribution. Many of them may be of very little intrinsic value, and it is only to avoid their being absolutely wasted that the distribution is

permitted. The great majority also are, of necessity, *very small*, and may require careful treatment for a time.

Fellows are particularly requested to note that a Form of Application and list to choose from of the plants available for distribution is sent in January *every year* to every Fellow, enclosed in the "Report of the Council." To avoid all possibility of favour, all application lists are kept until the last day of February, when they are all thrown into a Ballot; and as the lists are drawn out, so is the order of their execution, the plants being despatched as quickly as possible after March 1.

Of some of the varieties enumerated the stock is small, perhaps not more than twenty-five or fifty plants being available. It is, therefore, obvious that when the Ballot is kind to any Fellow he will receive the majority of the plants he has selected, but when the Ballot has given him an unfavourable place he may find the stock of almost all the plants he has chosen exhausted. A little consideration would show that all Fellows cannot be first, and some must be last, in the Ballot. Application forms received after March 1 and before April 30 are kept till all those previously received have been dealt with, and are then balloted in a similar way. Fellows having omitted to fill up their application form before April 30 must be content to wait till the next year's distribution. The work of the Gardens cannot be disorganized by the sending out of plants at any later time in the year. All Fellows can participate in the annual distribution *following* their election.

The Society does not pay the cost of packing and carriage. The charge for this will be collected by the carriers on delivery of the plants, which will be addressed exactly as given by each Fellow on his application form. It is impracticable to send plants by post, owing to the lack of Post Office facilities for despatch without prepayment of postage.

Fellows residing beyond a radius of thirty-five miles from London are permitted to choose double the number of plants to which they are otherwise entitled.

Plants cannot be sent to Fellows residing outside the United Kingdom, owing either to length of time in transit or to vexatious regulations in some foreign countries; but the Council will at any time endeavour to obtain for Fellows living abroad any unusual or rare seeds which they may have been unable to procure in their own country.

No plants will be sent to Fellows whose subscription is in arrear, or who do not fill up their forms properly.

20. EXHIBITIONS, MEETINGS, AND LECTURES IN 1913.

The programme will be found in the "Book of Arrangements" for 1913. An Exhibition and Meeting is held practically every fortnight throughout the year, and a short lecture on some subject connected with Horticulture is delivered during the afternoon.

A reminder of every Show will be sent in the week preceding to any Fellow who will send to the R.H.S. Offices, Vincent Square, S.W., a sufficient number (31) of halfpenny cards *ready addressed* to himself.

21. DATES FIXED FOR 1913.

Jan. 7, 21.
Feb. 4, 11 (Annual Meeting only), 18.
March 4 and 5 (Spring Bulbs), 18.
April 1, 15, and 16 (Daffodils), 29.
May 1 (Roses), 14 (Tulips, Wednesday, not Tuesday), 20, 21, and 22 (Spring Show, Chelsea), 27–30. (Rhododendron Show).
June 3, 17 (Gladiolus).
July 1, 2, and 3 (Holland House), 15, 17 (Sweet Peas), 18 (Carnations), 29 (Gladiolus).
Aug. 12, 26.
Sept. 9, 11, 12 (Roses), 23 (Dahlias and Vegetables), 25 and 26 (Fruit Show).
Oct. 7, 21.
Nov. 4, 18.
Dec. 2, 3 (Carnations).

22. SPRING AND SUMMER SHOWS, 1913.

(a) *Spring Show.*

It is with reluctance that the Council have found it necessary to change the site of the Spring Show. For some five-and-twenty years past the Society have enjoyed the hospitality of the Treasurer and Benchers of the Inner Temple, in whose gardens a series of wonderful Flower Shows have been held. The increasing attendance and consequent overcrowding in recent years have, however, compelled the Council to seek for a larger site; they have, therefore, accepted the invitation of the Governors of the Royal Hospital, Chelsea, to hold the Spring Shows in future on the same site as the recent International Horticultural Exhibition.

(b) *Summer Show.*

The Summer Show will be held at Holland House as usual, the dates being July 1, 2, and 3.

Details of both Exhibitions will be published in due course, and Fellows are asked to make them widely known and to do their utmost to induce the attendance of their friends.

23. EXHIBITS OF HORTICULTURAL SUNDRIES.

Owing to the lack of space it has hitherto been impossible to accept exhibits of Horticultural Sundries at the Spring Show. Abundant accommodation is, however, provided in close proximity to the floral exhibits in the arrangement of the show ground at Chelsea, which Sundriesmen will doubtless be glad to occupy. Plans of positions, &c., are now ready for issue.

24. RHODODENDRON SHOW, MAY 27–30, 1913.

Messrs. John Waterer and Sons, of Bagshot, have arranged to hold another Exhibition of Rhododendrons in the Royal Horticultural Hall from May 27–30, 1913. Fellows' Tickets will admit.

25. A NATIONAL DIPLOMA IN HORTICULTURE.

Most gardeners will welcome the establishment by the Society of a scheme whereby a National Diploma in Horticulture may be gained by those professional gardeners who pass the Preliminary and Final Examinations which will be required. The Diploma will be thoroughly "National," for by the consent of H.M. Government the Department of Agriculture, after being approached in the matter, has consented to co-operate with the Society if the Society will undertake the work of organizing the Examinations, and has authorized that the Diploma shall bear the following words: "Awarded by the Royal Horticultural Society under a scheme approved by the Board of Agriculture."

The Examinations will be written, viva voce, and practical. The practical part will be held in suitable gardens at convenient centres in the country. The first Diploma Examination will be held in 1914, and thereafter annually. Fuller information will appear with the Syllabus shortly, until which time it is requested that no letters of enquiry may be sent.

26. R.H.S. CUPS, 1913.

The Council have decided in future to adopt one special and distinctive form of Cup for each year, and to have it made in four different sizes for the 1913 Shows. The pattern adopted for next year will be found illustrated in the "Book of Arrangements," p. 65. The four different sizes will be known as follows:—

1. The R.H.S. Silver-gilt Cup.
2. The R.H.S. Large Silver Cup.
3. The R.H.S. Silver Cup.
4. The R.H.S. Standard Cup (so called because its design standardizes the pattern for the year).

27. CHALLENGE CUPS.

The following Challenge Cups are also annually offered for competition:—

1. The Silver-gilt Coronation Cup (value sixty guineas), awarded by the Council to whatever in their opinion is the most meritorious group at the Summer Show. The winner has the custody of the Cup for twelve months, and on its return the Council presents the holder with a small reproduction of it. (See "Book of Arrangements," p. 86.)

2. The Sutton Challenge Cup (value £21) and £10 is offered for a collection of 12 distinct kinds of vegetables. (See "Book of Arrangements," p. 99.)

3. The Vegetable Champion Cup (value £21) will be held for one year by the winner of the greatest number of First Prize points throughout the Society's Vegetable Exhibition—the winner of the Sutton Cup being excluded. (See "Book of Arrangements," p. 100.)

4. The Affiliated Societies Fruit Cup (value £21). (See "Book of Arrangements," p. 100.)

5. The Wigan Cup for Roses. (See "Book of Arrangements," p. 88.)

6. The Gordon-Lennox Fifty-guinea Challenge Cup for Hardy Flowers, July 1. (See Notice 29 and "Book of Schedules," 1913.)

7. The Seventy-five Guinea Cory Challenge Cup for Dahlias, September 23. (See Notice 30 and "Book of Schedules," 1913.)

28. SPECIAL CUPS FOR 1913.

The following have been offered to and accepted by the Council viz. :—

1. A Twenty Guinea Silver Cup presented by N. N. Sherwood, Esq., V.M.H., which the Council offer for Roses at the Holland House Show. (See "Book of Arrangements," p. 90.)

2. A Silver Cup presented by Reginald Farrer, Esq., for Alpine Plants, which the Council offer at the Chelsea Show. (See "Book of Arrangements," p. 67.)

3. A Silver Cup presented by Messrs. R. Wallace for Alpine Plants, Bulbs, and Dwarf Shrubs, which the Council offer at Vincent Square on March 4. (See "Book of Arrangements," p. 46.)

4. A Silver Trophy presented by Mr. Clarence Elliott for an Alpine Rock Garden, which the Council offer at Vincent Square on Wednesday, May 14. (See "Book of Arrangements," p. 59.)

5. A Silver Cup presented by Messrs. Barr for Daffodils, which the Council offer at Vincent Square on April 15. (See "Book of Arrangements," p. 57.)

6. A Silver Cup presented by E. H. Davidson, Esq., for a Cattleya, which the Council offer at the Chelsea Show. (See p. ccxcii and "Book of Schedules," 1913.)

29. THE GORDON-LENNOX CHALLENGE CUP FOR HARDY FLOWERS.

This Cup, value Fifty Guineas, presented to the Society by Lady Algernon Gordon-Lennox, is offered by the Council for competition by Amateurs at the Holland House Show on July 1, 1913, for a group of Hardy Perennial and Biennial Border Plants, including Bulbous, Tuberous, and Rhizomatous plants in pots, or as cut blooms, or both ; quite Dwarf Shrubby Plants, such as certain kinds of Erica, Helianthemum, Pentstemon and Dianthus, are eligible, but excluding absolutely Annuals and any Half-Hardy Plants which, like Dahlias, in most places require starting under glass or with gentle heat. The group must occupy a space not exceeding 15 feet by 10 feet on the ground.

The winner will hold the Cup for one year, subject to a sufficient insurance against loss, and a written guarantee to return it in good condition, or, failing this, to refund to the R.H.S. the sum of £55. On return of the Cup in good condition the Council will present the holder with a small commemorative Cup of similar design.

The object of this competition is to draw attention to the most desirable hardy border flowers—exclusive of annuals, roses, and flowering shrubs, though certain very dwarf-growing shrubby plants, like the old Clove Carnation, for example, may be included in the term "Hardy Border Plants" for the object of this competition.

The same exhibitor may win the Cup only once in three years, but should the winner of the previous year again be considered first the Council will bestow a special award.

The decision of the Council is final, and the Cup may be altogether withheld at their discretion.

The Council will not award this high distinction unless satisfied and assured that the exhibit is, in the main, due to the work and capability of the exhibitor or his employees, and on this point the Council may consult any expert not competing for the Cup.

The Council may reserve decision till the third day of the Show.

The attention of intending exhibitors is particularly directed to the Society's 1911 Code of "Rules for Judging."

30. DAHLIA PRIZES AT THE R.H.S. MEETING ON SEPTEMBER 23, 1913.

The object of this competition is not so much to attract the finest cut blooms as seen on the Show stand, for such flowers may, when growing on the plant, be almost invisible, and no contribution to the decoration of the *Garden*, whatever they may be for cutting. The object is to discover the most Decorative Garden Dahlias—that is, those varieties which add most to the beauty of the Garden, and, as is well known, not a few of the most glorious Dahlia flowers add nothing to the aspect of the Garden as they are hidden beneath the foliage. They may be excellent to grow in the Kitchen Garden to cut for house decoration, but they are useless for the ornamentation of the Pleasure Garden. (See paragraph 31.)

SCHEDULE.

Class A. Amateurs.—A group of Decorative Garden Dahlias of all or any sections. Twelve feet run of 3 feet tabling, not to be built up more than 8 feet in height from the ground level.

First Prize :—R.H.S. Silv r Cup, to which will be added the Veitch Memorial Medal.

The Council may make other awards according to merit.

Class B. Open.—A group of Decorative Garden Dahlias of all or any sections. Twenty-five feet run of 3 feet tabling, not to be built up more than 8 feet in height from the ground level.

First Prize :—Seventy-five Guinea Challenge Cup, presented to the R.H.S. by Reginald Cory, Esq.

The Council will make other awards according to merit.

In both Classes all the stems must touch the water and no wiring or artificial support will be allowed. Hardy foliage or grasses may be employed for decoration.

The winner will hold the Cory Cup for one year, subject to a sufficient insurance against loss, and to a guarantee to return it in good condition, or, failing this, to refund to the R.H.S. the sum of eighty guineas. On the return of the Cup the Council will present the holder with a small commemorative Silver Cup.

The same exhibitor may win the Cup only once in three years, but should the winner of the previous year be again considered first the Council will bestow a special award.

The decision of the Council is final, and the Cup may be altogether withheld at their discretion.

The Council will not award this high distinction unless satisfied and assured that the exhibit is, in the main, due to the work and capability of the exhibitor or his employees, and on this point the Council may consult any expert not competing for the Cup.

The attention of intending exhibitors is particularly directed to the Society's 1911 Code of "Rules for Judging."

31. INSPECTION OF GROWING DAHLIAS.

In order to assist in the adjudication of the Cory Cup award (see paragraph 30) it has been suggested to the Council that the Judges should inspect a very large collection of Decorative Garden Dahlias which will be growing in Mr. Reginald Cory's Garden at Cardiff, where the habit of the respective plants can be observed, and their true value from the point of view of garden decoration can be determined. Three Judges of the R.H.S. Floral Committee are accordingly co-operating with three Judges of the National Dahlia Society, with the Chairman of the Floral Committee as President, and a visit to Mr. Cory's Garden will be made in the week preceding the date of the competition for the Cup. The object of this inspection of the growing plants is to prevent the Judges for the Cup being misled, as to a plant's value as a Decorative Garden Plant, by blooms however intrinsically beautiful but gathered from a plant of little value as a Decorative Garden Plant.

32. PRIMULA CONFERENCE.

A Primula Conference has been arranged for April 16, 1913, when Sir John Llewelyn, Bart., will occupy the Chair. The Papers to be read are as follows:—"Himalayan Primulas," by Mr. Craib, of Kew; "European Hybrids in Nature," by Mr. Reginald Farrer; "Primulas from a Garden Point of View," by Miss Jekyll; "Chinese Species of Primula," by Professor Bayley Balfour, F.R.S.; "European Primulas," by Dr. John MacWatt.

33. EXAMINATIONS, 1913.

1. The Annual Examination in the Principles and Practice of Horticulture will be held on April 2, 1913. The Examination has two divisions—viz. (*a*) for Candidates of eighteen years of age and over, and (*b*) for Juniors *under* eighteen years. Particulars for 1913 may be obtained by sending a stamped and directed envelope to the Society's Offices. Copies of the Questions set from 1893 to 1912 (price 2*s.* post free) may also be obtained from the Office. The Society is willing to

hold an Examination wherever a magistrate, clergyman, schoolmaster, or other responsible person accustomed to examinations will consent to supervise one on the Society's behalf.

The Examination will not be held outside the British Isles until further notice.

In connexion with this Examination a Scholarship of £25 a year for two years is offered by the Royal Horticultural Society, to be awarded after the 1913 Examination to the Student who shall pass highest, if he is willing to accept the conditions attaching thereto. The main outline of these conditions is that the holder must be of the male sex, and between the ages of eighteen and twenty-two years, and that he should study gardening for one year at least at the Society's Gardens at Wisley, conforming to the general rules laid down there for Students. In the second year of the Scholarship he may, if he like, continue his studies at some other place at home or abroad which is approved by the Council of the Society. In case of two or more eligible Students being adjudged equal, the Council reserve to themselves the right to decide which of them shall be presented to the Scholarship.

2. The Society will also hold an Examination in Cottage Gardening on April 23, 1913. This Examination is intended for, and is confined to, Elementary and Technical School Teachers. It is undertaken in view of the increasing demand in country districts that the Schoolmaster shall be competent to teach the elements of Cottage Gardening, and the absence of any test of such competence. The general conduct of this Examination is on similar lines to that of the more general Examination. Questions on Elementary Chemistry and Biology are included in this Examination.

Medals and Certificates are awarded and Class Lists published in connexion with these Examinations. The Syllabus may be obtained on application to the Secretary, R.H.S., Vincent Square, Westminster, S.W.

34. INFORMATION.

Fellows may obtain information and advice from the Society as to the names of flowers and fruit, on points of practice, insect and fungoid attacks, and other questions, by applying to the Secretary, R.H.S., Vincent Square, Westminster, S.W. Where at all practicable it is particularly requested that letters and specimens may be timed to reach Vincent Square by the first post on the mornings of the Fortnightly Meetings, so as to be laid before the Scientific or other Committees at once.

35. INSPECTION OF FELLOWS' GARDENS.

The Inspection of Gardens belonging to Fellows is conducted by a thoroughly competent Inspector from the Society, who reports and advises at the following cost—viz. a fee of £3 3*s.* for one day (or £5 5*s.* for two consecutive days), together with all out-of-pocket expenses. No inspection may occupy more than two days, save by special arrangement. Fellows wishing for the services of an Inspector are requested to give at least a week's notice and choice of two or three days, and to indicate the most convenient railway station and its distance from their Gardens. Gardens can only be inspected at the *written* request of the *owner.*

Nota Bene.—The work of inspecting Fellows' Gardens and advising thereupon has increased so much of recent years, and has necessitated Mr. Wright's absence from the Wisley Garden so often, that the Council of the Society have long felt the desirability of appointing an Inspector of Fellows' Gardens who should be entirely independent of the Wisley staff, thus leaving Mr. Wright free to devote his whole time to the Society's Garden and to the Society's Shows.

The very great difficulty of finding an Inspector who should not only be as efficient and capable as Mr. Wright, and one who is also in constant touch with a fine garden and all the newest additions to horticulture, has at last been overcome by the kindness of Miss Willmott, of Warley, who has consented to her head gardener, Mr. C. R. Fielder, V.M.H., being appointed Inspector to the Society, and at the same time allowing him to remain in constant daily touch with her celebrated garden at Warley Place.

From May 1, therefore, Mr. C. R. Fielder, V.M.H., so well and honourably known in gardening circles, will be the Royal Horticultural Society's Inspector to visit Fellows' Gardens, and to advise thereupon on the terms mentioned on page 9 of the "Book of Arrangements," 1913. All requests for the Inspector's services should be made to the Secretary, R.H.S. Office, Vincent Square, Westminster, S.W.

36. AFFILIATION OF LOCAL SOCIETIES.

One of the most successful of the many new branches of work undertaken since the reconstruction of the Society in 1887 is the unification of local Horticultural Societies by a scheme of affiliation to the R.H.S. Since this was initiated no fewer than 300 Societies have joined our ranks, and the number is steadily increasing.

To the privileges of Affiliated Societies have been added all the benefits accruing under the scheme recently introduced for the Union of Horticultural Mutual Improvement Societies.

Secretaries of Affiliated Societies can obtain on application a specimen of a Card which the Council have prepared for the use of Affiliated Societies for Certificates, Commendations, &c. Price 3*s.* 6*d.* for 10 copies, 5*s.* 6*d.* for 20, 11*s.* 6*d.* for 50, 20*s.* for 100.

The Council have also struck a special Medal for the use of Affiliated Societies. It is issued at cost price in Bronze, Silver, and Silver-gilt—viz. Bronze, 5*s.* 6*d.*, with case complete; Silver, 12*s.* 6*d.*, with case complete; Silver-gilt, 16*s.* 6*d.*, with case complete. Award Cards having the Medal embossed in relief can be sent with the Medal if ordered, price 6*d.* each.

37. AFFILIATED SOCIETIES' CERTIFICATE CARDS.

At the request of several of the Affiliated Societies, the Council have had the Certificate Card (issued some years ago for the use of Affiliated Societies) beautifully coloured and it will be available in March. The uncoloured Card will still continue to be issued at the old prices, and the new coloured Card at 8*d.* a single copy, or 10 for 5*s.*, post free.

38. CARDS FOR EXHIBITS OF VEGETABLES, &c., INDICATING THE POINTS CONSTITUTING GOOD QUALITY.

Affiliated Societies' Exhibitions.

As an outcome of a suggestion made to the Secretary by an Affiliated Society, the descriptions of "excellence" of various fruits and vegetables, appearing in the R.H.S. Code of "Rules for Judging," have been printed on stiff Cards, thus:

ROYAL HORTICULTURAL SOCIETY.

RULES FOR JUDGING: Section 100.

CARROTS.—Of medium size according to variety;
Good and even form;
Skin and colour clear and bright;
Free from side roots;
Flesh tender.

Points 8.—	Form and Colour	3
	Condition	2
	Uniformity	2
	Size	1

The intention is that these Cards should be put up conspicuously at Affiliated Societies' Shows amongst the exhibits of vegetables, &c., referred to. Their educational value will be at once apparent, for visitors, instead of viewing the exhibits with little or no idea of what constitutes excellence, will have before them, near each exhibit, the "points" from a Judge's standpoint. Thus they will see for themselves where an exhibit has succeeded or failed, and in what direction their own efforts should be turned if they are to become prize-winners.

There are 25 Cards in the set, and the subjects dealt with are Carrot, Kale, Leek, Beans, Cucumber, Cauliflower, Beet, Radish, Celery, Pea, Spinach, Tomato, Rhubarb, Cabbage, Brussels Sprouts, Potato, Parsnip, Vegetable Marrow, Lettuce, Turnip, Onion, &c. The price is 1*s.* 6*d.* a set, from the Secretary, R.H.S., Vincent Square, S.W.

39. UNION OF HORTICULTURAL MUTUAL IMPROVEMENT SOCIETIES.

This Union has been established for the encouragement and assistance of Horticultural Mutual Improvement Societies, the object being to strengthen existing Societies, to promote interchange of lecturers, to provide printed lectures, and if possible to increase the number of these useful Societies.

A list of lecturers and their subjects, and a list of typewritten lectures, with or without lantern slides, prepared by the Society, may be obtained from the Secretary, R.H.S., price 3*d.*

Lantern slides on horticultural topics are much needed, and their gift will be very much appreciated.

40. RULES FOR JUDGING—1911 CODE.

The "Rules for Judging, with Suggestions to Schedule Makers and Exhibitors," have been revised, and the new edition is now ready. Special attention is drawn to the amended Rule defining "an amateur," with suggestions for establishing four distinct classes of amateurs to meet the requirements of larger or smaller local Societies. (See also p. 37, "Book of Arrangements.") The "pointing" recommended for fruits and vegetables has also been considerably amended, and the terms "annuals" and "biennials" further explained. The Secretaries of Local Societies are advised to obtain a fresh copy. It will be sent post free on receipt of a postal order for 1*s.* 6*d.*, addressed to the Secretary, Royal Horticultural Society, Vincent Square, Westminster, S.W.

Exhibitors of vegetables are specially warned that the numbers of specimens to a dish appearing on p. 19 of the 1909 Code of Rules have been still further modified.

41. SPRAYING OF FRUIT TREES.

The Report of the Conference on the Spraying of Fruit Trees, held in the R.H.S. Hall on October 16, 1908, may still be obtained at the Society's Offices, Vincent Square, Westminster, price 1*s.* The book deals with the methods of spraying fruit trees for both insect and fungus pests, with information as to washes and spraying machinery, and forms the latest collated information on this subject.

42. VARIETIES OF FRUITS.

Many people plant fruit trees without a thought of what variety they shall plant, and as a result almost certain disappointment ensues, whilst for an expenditure of 2*d.* they can obtain from the Society a little 16-page pamphlet, which contains the latest expert opinion on Apples, Pears, Plums, Cherries, Raspberries, Currants, Gooseberries, and Strawberries, together with Notes on Planting, Pruning, and Manuring, which for clearness of expression and direction it would be impossible to surpass. It has in fact been suggested that no other 16 pages in the English language contain so much and such definite information. At the end of the pamphlet are given the names of some of the newer varieties of fruits, which promise well, but are not yet sufficiently proved to be recommended for general planting.

Copies of this pamphlet for distribution may be obtained at the Society's Office, Vincent Square, Westminster. Price, post free: single copy, 2*d.*, or 25, 2*s.*; 50, 3*s.*; 100, 4*s.*

43. PLANTS CERTIFICATED.

The last-published list of "Plants Certificated by the Society" commenced with the year 1859 and closed with 1899. A further eleven years have now passed and the Council have republished the list up to the end of 1910, constituting a record of all the plants which have received awards

during the past fifty years. The completed list will be of great assistance to amateurs and an absolute necessity to raisers and introducers of new plants. It is now ready, price 2*s*. post free, not including Orchids.

ORCHIDS CERTIFICATED.

The list of awards made to Orchids, with parentage, &c., has recently been published separately, and may be obtained at the Society's Office, Vincent Square, Westminster, bound in cloth and interleaved, price 5*s*. net.

44. RECOGNITION OF DILIGENT INTEREST IN PLANTS.

The Council have founded a Card of "Recognition of Diligent Interest in Plants." Issued in response to frequent applications by school authorities for some token of encouragement of work with plants amongst scholars, it is to be awarded to the boy or girl (or both) who, in the yearly school competitions in plant cultivation, or garden-plot keeping, or Nature study, has secured the first prize. The Cards are 12 inches by 8 inches, and may be had on application to the Secretary, R.H.S., Vincent Square, London, S.W. (price 6*d*. each). The application should contain information as to (*a*) the nature of the competition, (*b*) the number of competitors, (*c*) the judges, (*d*) the number of prizes awarded in the competition, (*e*) the full name of the first prize-winner, and should be signed by the head-teacher and a member of the education authority concerned. The Council of the R.H.S. will at their own absolute discretion grant or withhold this "recognition."

45. DISBUDDING OF ORCHIDS.

At the request of the Orchid Committee the Council have made a rule that "Awards will not be given to any Orchids of which the natural size and character of the flowers have, in the opinion of the Orchid Committee, been in any way changed or improved through the removal of a bud or buds, or part of the spike."

46. ADVERTISEMENTS.

Fellows are reminded that, the more they can place their orders with those who advertise in the Society's Publications the more likely others are to advertise also, and in this way the Society may be indirectly benefited.

THE DAVIDSON ANNUAL CUP.

The Council have accepted the kind offer of an annual silver Cup from E. H. Davidson, Esq., of Borlases, Twyford.

In 1913 it will be awarded in Open Competition at the Society's Spring Show at Chelsea, on May 20 to 22, for the "Finest Cattleya, not a hybrid, in the Show."

The decision of the Council is final, and the Cup may be altogether withheld at their discretion.

The Council will not award this high distinction unless satisfied and assured that the Exhibit is, in the main, due to the work and capability of the Exhibitor or his employees; on this point the Council may consult any expert not competing for the Cup.

The Council may reserve decision till the third day of the Show.

The attention of intending exhibitors is particularly directed to the Society's 1911 Code of "Rules for Judging."

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The references in italics are to figures and illustrations

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